

Digital Tools for Early Childhood Educators



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Introduction

Early childhood education (ECE) refers to the teaching and care of children from birth through third grade, a developmental period that includes preschool, kindergarten, and the early primary grades (Institute of Educational Sciences, 2025). These years represent one of the most critical phases of human development—when children build the foundational skills for communication, curiosity, problem-solving, and social connection that will guide lifelong learning. In today’s world, technology is woven into nearly every aspect of life, and early learning is no exception. Digital tools have the potential to enrich instruction, strengthen home–school connections, and extend play-based exploration into new dimensions. Yet, for early childhood educators, technology must be used with care and intention. The goal is not to replace hands-on, relationship-driven learning, but to enhance it. When grounded in developmental principles and thoughtful pedagogy, digital tools can spark creativity, promote collaboration, and help children explore and express ideas in meaningful ways.

This course explores the evolving role of technology in early childhood education—examining both its opportunities and challenges through a lens of developmentally appropriate practice. Across four sections, educators will learn how to evaluate, select, and implement digital tools that align with young children’s cognitive, physical, and social-emotional growth. Topics include understanding the role of technology in ECE; addressing key concerns such as equity, safety, and screen time; evaluating digital resources using research-based frameworks; and applying effective classroom practices for different age groups. By the end of this course, educators will be equipped with the knowledge and confidence to make informed, ethical, and purposeful decisions about technology use. Through reflection, application, and evidence-based strategies, participants will learn how to integrate digital tools in ways that honor the essence of early

childhood education - learning through play, exploration, and meaningful relationships.

Section 1: The Role of Technology in Early Childhood Education

Technology has always shaped how we teach and learn but never as rapidly as it does today. From the first chalkboards and film projectors to today's interactive tablets and artificial intelligence-powered tools, each innovation has transformed the classroom experience. For early childhood educators, understanding this evolution is essential to making informed decisions about how digital tools can enhance - not replace - the foundational elements of early learning. These early years of learning are characterized by rapid growth in language, cognition, motor skills, and social-emotional development. Play, exploration, and relationships form the heart of how children learn. Technology, when used thoughtfully, can serve as a bridge that supports these natural learning processes, offering opportunities for creativity, collaboration, and discovery that extend beyond traditional classroom boundaries.

This section explores how technology has evolved in education, the myths and realities of its use in early learning, and the ways it can support play-based instruction when applied intentionally and appropriately. It also examines the major frameworks and guidelines that shape professional best practices, including the National Association for the Education of Young Children (NAEYC) and Fred Rogers Institute's joint position on technology in early childhood programs. The section concludes by highlighting the many benefits of technology across children's physical, cognitive, and social-emotional development—emphasizing how, when guided by developmental principles, digital tools can enhance hands-on learning and prepare young children for success in a connected world.

1.1 Understanding the Evolving Digital Landscape

As the digital landscape continues to evolve, educators are now navigating tools such as artificial intelligence (AI), augmented reality (AR), and voice-enabled technologies, which are reshaping how young children engage with content and each other. Today's learners encounter technology almost everywhere - at home, in schools, and in their communities - making it increasingly important for teachers to guide its use intentionally. By understanding where educational technology began and how it has changed over time, educators can better appreciate its role in supporting developmentally appropriate practice and designing classroom experiences that balance innovation with the enduring power of play.

Historical Overview

Technology in education has evolved dramatically - from simple, tactile learning aids to today's immersive digital experiences. Understanding this evolution helps educators appreciate how each innovation has shaped modern teaching and how these changes continue to influence early childhood classrooms.

From Hornbooks to Chalkboards: The Early Tools of Learning

In the earliest American classrooms, learning was hands-on, but tools were rudimentary. During the Colonial era, children used hornbooks - wooden paddles with printed lessons - to learn the alphabet and basic verses. As centuries passed, the invention of the Magic Lantern in the late 1800s allowed teachers to project images for group learning, a major leap toward visual instruction (Purdue University, 2024). The introduction of the chalkboard around 1890 and the pencil by 1900 brought new ways to record, share, and reinforce learning. Although these may seem primitive by today's standards, each innovation represented a significant step toward increasing engagement and accessibility in education - two

principles that continue to guide early childhood technology use today (Purdue University).

The Arrival of Media and Mechanized Learning

The 20th century introduced technologies that began to transform instruction from one-directional to interactive. The radio in the 1920s allowed children to hear lessons and stories beyond their classroom walls, while overhead projectors and videotapes in later decades gave teachers tools to present information visually and dynamically (Purdue University, 2024). The Skinner Teaching Machine in the 1950s even introduced the concept of individualized learning—students received immediate feedback and could progress at their own pace, a foundational idea behind today’s adaptive learning programs (Purdue University). For young children, this era marked the beginning of multisensory learning - hearing, seeing, and doing - an approach that remains essential in early education.

The Computer Revolution

By the 1980s, the introduction of personal computers signaled a new era of educational possibility. IBM’s 1981 computer and Apple’s early models brought digital tools into schools, laying the groundwork for technology as a standard part of learning. What began as typing practice and simple games soon expanded to include creative software for writing, drawing, and problem-solving (Purdue University, 2024). As the internet became widely accessible in the 1990s, classrooms connected to a world of information and collaboration. By 2009, nearly every U.S. classroom had computers with internet access, and digital tools—from interactive whiteboards to educational apps—became integral to instruction (Purdue University).

Technology Today: A Connected and Personalized Classroom

Today's classrooms are dynamic, multimedia environments. From tablets and touchscreens to interactive storytelling and early coding apps, technology offers young children new ways to explore ideas and express creativity. Educators use digital portfolios to document learning, families stay connected through classroom apps, and children engage with digital tools that support literacy, numeracy, and social-emotional development (Purdue University, 2024). Modern technology also allows teachers to differentiate instruction—meeting each child where they are developmentally—and to engage students through visual, auditory, and kinesthetic experiences.

Looking Ahead: The Future of Early Learning Technology

One of the most intriguing emerging technologies is biometrics, which uses physical and behavioral traits—like facial expressions, heart rate, or body movement—to gather information about a person's state of being (Purdue University, 2024). In future classrooms, biometric technology could help educators better understand students' emotional and physical engagement in real time. For instance, sensors might detect when a child is frustrated, tired, or deeply focused, allowing teachers or adaptive learning programs to adjust lessons accordingly (Purdue University).

Another exciting development is Augmented Reality (AR), a technology that overlays digital information—such as images, sounds, or animations—onto the real world (Purdue University, 2024). AR tools, such as glasses or tablet-based applications, have the potential to make learning deeply immersive and interactive. Imagine a group of kindergarteners exploring the solar system by pointing a tablet at the classroom wall and watching planets appear in orbit, or preschoolers “meeting” historical figures through animated storytelling. AR can

bring abstract concepts to life in ways that are both visual and tactile, encouraging curiosity and active participation.

Building on the touchscreen technology already familiar to most children, multi-touch surfaces are being developed for entire desks, tables, or classroom workstations; these interactive surfaces could enable groups of children to manipulate digital objects together—drawing, sorting, matching, or building collaboratively (Purdue University, 2024). For example, students across the globe could connect virtually to solve puzzles or create artwork together in real time.

1.2 Myths and Realities: Technology in the Early Years

When educators hear about technology in the early childhood classroom, it often sparks a wide range of reactions, from enthusiasm to concern. Many teachers envision screens and tablets dominating children's experiences, raising questions about developmental appropriateness and play. However, today's concept of digital technology in early learning extends far beyond screens. It includes an array of hands-on, exploratory tools designed to nurture curiosity, creativity, and discovery - core elements of early childhood education.

Understanding Technology in Early learning

Technology in early learning is about interaction, not isolation. It can be as simple as a flashlight used for exploring light and color or as sophisticated as a programmable robot that helps children understand patterns and problem-solving (Waite, 2025). Other examples include digital microscopes that inspire observation, sound recorders that promote language development, and light tables that foster investigation and creativity. These tools invite children to explore, test, and question their environment—supporting cognitive and sensory development through active learning (Waite). In this sense, technology in early

childhood should be viewed as an extension of play, not a departure from it. When integrated thoughtfully, digital tools help children make connections between the physical and digital worlds, reinforcing skills like collaboration, experimentation, and creativity (Waite).

Addressing Common Misconceptions

Despite growing familiarity with technology, several myths still persist in early childhood education. Let's address a few key misconceptions (Waite, 2025):

- **Myth 1: Technology means screen time.**

Reality: Digital technology in early learning encompasses far more than tablets or computers. It includes hands-on tools such as coding toys, digital cameras, and interactive storytelling apps that encourage active learning and exploration.

- **Myth 2: Technology isolates children.**

Reality: When implemented intentionally, technology can promote social interaction and collaboration. Children can work together on digital art projects, record stories, or share discoveries through photos and videos.

- **Myth 3: Young children aren't ready for technology.**

Reality: Children are natural explorers of their environments—including digital ones. When guided by educators, they learn to use technology safely, creatively, and purposefully.

- **Myth 4: Technology replaces traditional play.**

Reality: The goal is not to replace play, but to enhance it. Technology should complement hands-on learning experiences, offering new avenues for storytelling, design, and discovery.

As early childhood educators, our role is to prepare children for a world where technology is an everyday tool for learning and communication. The challenge is not whether to use technology, but how to use it wisely. By understanding the full range of what technology in early learning can offer—beyond screens and apps—we can create experiences that honor the heart of early learning: curiosity, creativity, and connection.

1.3 Technology as a Support for—Not a Replacement of—Play-Based Learning

In today's digital world, children are growing up surrounded by technology. According to Common Sense Media, more than 50% of children eight and younger have their own mobile device, and 40% begin using tablets as early as age two (Lovell, 2025). While this reflects a major shift in how children encounter the world, one essential truth remains unchanged: play continues to be the foundation of early learning. Play-based learning supports every domain of development—cognitive, social, emotional, and physical. It is through play that children learn to communicate, solve problems, experiment, and express themselves creatively (Lovell). The best early learning environments give children the freedom to make choices, follow their interests, and explore at their own pace. This autonomy nurtures curiosity, confidence, and intrinsic motivation—qualities that set the stage for lifelong learning.

The Role of Technology in Play

While some parents and educators worry that technology may interfere with or replace play, research and practice increasingly show that, when used thoughtfully, technology can enrich play-based learning rather than diminish it; digital tools, games, and interactive experiences can serve as catalysts for creativity, problem-solving, and collaboration (Lovell, 2025). When technology is

designed intentionally for young learners, it encourages active participation rather than passive consumption. For example, creative apps like *Crayola Create and Play* or *Crayola Adventures* allow children to tell stories, design characters, experiment with color, and express ideas through art and play. These experiences are not just digital entertainment—they engage fine motor skills, imagination, and emotional expression while providing opportunities for parent-child interaction (Lovell). Crayola’s apps are just one example of how technology can enhance play-based learning—many other tools offer similar opportunities. These open-ended digital experiences reflect the core principles of traditional play by providing freedom, choice, and discovery. They encourage children to experiment, explore ideas, and take creative risks within a safe and supportive environment (Lovell).

The Science Behind Play-Based Learning

Research confirms that play is the most effective way for young children to make sense of their world (Lovell, 2025). Psychologist Peter Gray describes play as the “unlimited freedom to explore and pursue one’s own interests,” highlighting how it builds essential skills for thinking, learning, and relating to others (as cited in Lovell). When play is integrated with well-chosen technology, children can engage with concepts like cause and effect, sequencing, and collaboration in new and exciting ways. Technology does not replace tactile, social, or imaginative experiences—it extends them. For instance, a child using a coding robot might act out stories or navigate obstacle courses, blending digital problem-solving with physical movement and creative storytelling (Lovell).

Long-Term Benefits of Integrating Technology and Play

When play and technology intersect in developmentally appropriate ways, the benefits for children are substantial. Research and classroom practice show that technology-supported play can do the following (Lovell, 2025):

- Encourage curiosity and exploration, motivating children to try new ideas.
- Strengthen self-confidence as children experience success in creative or problem-solving tasks.
- Enhance emotional expression through art, music, or storytelling activities.
- Promote independent play and focus, as children engage deeply in meaningful exploration.
- Build problem-solving and critical thinking skills through open-ended challenges.

These outcomes reinforce what early childhood educators have long known—children learn best when they are engaged, joyful, and in control of their learning experiences.

Digital Resources for Play-Based Learning

High-quality digital resources, when chosen thoughtfully, can spark curiosity, imagination, and collaboration while maintaining the active, hands-on spirit of early childhood learning. These tools are not meant to replace play, but to launch it—providing rich opportunities for children to create, question, and explore ideas inspired by what they see and do.

Digital Resources as Launching Points for Play

PBS Kids is one of the most recognized leaders in developing research-based educational media for young learners. Its collection of videos, apps, digital games, and hands-on extensions are designed to complement play-based learning, not replace it. Many PBS resources are intentionally sequenced into lesson plans and curriculum units so that an engaging video or interactive game becomes a springboard for open-ended exploration (Rosenfeld, 2022). For example, the *Molly*

of *Denali* series encourages children to connect media to their real-world experiences. After watching an episode about maps, recipes, or informational text, children might be inspired to make their own creations - such as drawing a map of their route to school, writing a recipe for a favorite snack, or creating a diagram of their playground (Rosenfeld). These playful extensions invite storytelling, problem-solving, and collaboration as children share, modify, and expand upon one another's ideas. Teachers can enhance learning by introducing vocabulary, measurement, or spatial concepts naturally within these activities. Such examples demonstrate that digital resources can inspire physical, creative play - bridging the gap between media engagement and real-world learning (Rosenfeld).

Digital Resources for Math and Science Discovery

Beyond literacy and storytelling, many digital tools are designed to cultivate curiosity in math and science. The *First 8 Studios Preschool Data Toolbox* is one such example. This app guides young children through authentic investigations—helping them pose questions, collect data, and visualize their findings. It includes pre-designed explorations while also allowing children to create their own “data stories” (Rosenfeld, 2022) For instance, children might explore how their moods change throughout the day by charting feelings during different activities. They can record, sort, and graph their observations—then discuss what might influence their emotions. In this way, digital tools become a playground for inquiry, allowing children to experiment, test ideas, and make connections between experiences and data (Rosenfeld). Educators play a vital role in this process—not as directors, but as co-explorers—supporting children's investigations, posing questions, and celebrating discoveries alongside them.

Digital Resources for Mathematical Play

Similarly, tools like *SolveMe Puzzles* transform abstract mathematical ideas into playful, concrete experiences. Through digital puzzles, children manipulate shapes and symbols to explore relationships, equivalence, and balance, often without using numbers (Rosenfeld, 2022). These interactive challenges promote problem-solving, logical reasoning, and persistence in a way that feels like play. Children can even design their own puzzles to demonstrate understanding, while educators scaffold thinking through prompts and guided discussion. By approaching math as a creative and exploratory process, digital puzzles help demystify complex concepts and lay a foundation for future success in mathematics (Rosenfeld).

Technology is not replacing play - it's reshaping how play can happen in a digital age. The key for educators is intentionality: using digital tools that enhance curiosity, support exploration, and preserve the wonder of childhood. When technology is viewed as an extension of play, rather than a substitute for it, children experience learning that is both imaginative and relevant to their world.

1.4 Positions, Frameworks and Guidelines

The use of technology in early learning has long prompted important questions for educators: How can digital tools be used in ways that truly benefit young children? What does “developmentally appropriate” technology use look like in practice? To help guide these decisions, the National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center for Early Learning and Children’s Media, now known as the Fred Rogers Institute, issued a joint position statement in 2012 titled *Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8* (NAEYC, 2025). This position statement represents one of the most influential frameworks for understanding technology’s role in early childhood education. It outlines both organizations’

shared beliefs about how technology and interactive media can support learning, relationships, and development when used intentionally and appropriately. More importantly, it establishes guiding principles that help educators make thoughtful choices about digital tools - emphasizing equity, active engagement, play, and the central role of human connection. Although this position was first adopted in 2012, it remains NAEYC's current and official stance on technology in early learning. The fact that it continues to serve as the organization's guiding framework more than a decade later speaks to its enduring relevance. The statement continues to inform best practices across early education settings, helping teachers balance innovation with the core values of early childhood education: play, exploration, and meaningful relationships.

The Position

The National Association for the Education of Young Children (NAEYC) and the Fred Rogers Institute (2012; 2025) affirm that technology and interactive media can be powerful tools for learning and development - when they are used intentionally and guided by developmentally appropriate practice (DAP). This means that educators should not simply use technology because it is available, but rather with clear learning goals and thoughtful consideration of how it supports each child's growth. Developmentally appropriate practice begins with understanding what is typical for children at a given age and stage of development, then adjusting instruction to meet the needs, interests, and cultural backgrounds of individual children (NAEYC and the Fred Rogers Institute). A child's experience with technology should be viewed within the context of family, community, culture, language, and prior experiences.

NAEYC and the Fred Rogers Institute (2012; 2025) recognize that digital media and technology are now part of most children's everyday lives; because of this, educators must make informed, intentional decisions about when and how to use

these tools in ways that enhance—not hinder—learning and social interaction. To do so, teachers need access to reliable information, professional resources, and ongoing training on how different forms of media influence children’s development (NAEYC and the Fred Rogers Institute). To support these efforts, NAEYC and the Fred Rogers Institute outline a series of guiding principles for technology use in early childhood programs. These principles emphasize purposeful integration, equity, engagement, and connection to the broader goals of early learning and child development.

Principles and Guidelines for Appropriate Use of Technology in Early Learning

The NAEYC and Fred Rogers Institute (2012; 2025) emphasize that technology and interactive media should be used intentionally, safely, and developmentally appropriately to enhance—never replace—the rich experiences that define early childhood education. These principles guide educators in making thoughtful, ethical, and child-centered decisions about digital tools in early learning settings (NAEYC and Fred Rogers Institute):

- 1. Technology Should First and Foremost Support Healthy Development:**
Technology and interactive media must always serve the child’s overall well-being—cognitive, physical, social, emotional, and linguistic. Digital tools should never harm, isolate, or exploit children and must not interfere with communication, play, physical activity, or social interaction (NAEYC and Fred Rogers Institute). Educators are encouraged to continually monitor new research on topics such as screen time, eye health, and physical effects of digital use to ensure technology supports, rather than hinders, healthy growth.
- 2. Developmentally Appropriate Practice (DAP) Guides All Technology Use:**
Decisions about when and how to use technology must align with

developmentally appropriate practice—grounded in knowledge of child development, individual differences, and family and cultural context (NAEYC and Fred Rogers Institute). Technology should be integrated thoughtfully into daily routines as one of many learning tools, balancing digital experiences with hands-on exploration, conversation, and play.

3. **Technology Enhances but Does Not Replace Traditional Learning:** Digital tools should complement, not substitute, essential early learning experiences such as creative play, outdoor exploration, art, and social interaction (NAEYC and Fred Rogers Institute). Appropriate uses of technology are active, engaging, and meaningful, encouraging children to explore ideas, solve problems, and express themselves creatively.
4. **Special Considerations for Infants and Toddlers:** For children under age two, responsive human interaction remains the foundation of learning and development. The statement aligns with public health guidance discouraging screen media for this age group. However, limited, intentional uses—such as co-viewing photos, reading digital storybooks together, or video chatting with family—can support relationships and communication when mediated by caring adults (NAEYC and Fred Rogers Institute).
5. **Educators Exercise Professional Judgment and Intentionality:** Early childhood educators are the key decision-makers in determining if, when, and how technology should be used. They must evaluate tools for age, cultural, and linguistic appropriateness; consider each child's interests and readiness; and observe how children engage with technology (NAEYC and Fred Rogers Institute). Educators are encouraged to continually learn about emerging technologies, critically assess marketing claims, and choose tools based on research and educational value rather than commercial appeal.

6. **Technology Promotes Inclusion and Accessibility:** When used thoughtfully, technology can increase equity and accessibility. Assistive technologies—such as communication devices or adaptive interfaces—can help children with disabilities participate more fully in classroom activities. For dual language learners, digital tools can support home-language development and cultural inclusion while fostering English proficiency (NAEYC and Fred Rogers Institute).
7. **Digital Tools Strengthen Home–School Connections:** Technology can enhance family engagement by facilitating communication between educators and families. Digital portfolios, photos, and classroom updates can help families feel connected to their children’s learning and better understand the value of play-based education (NAEYC and Fred Rogers Institute). Educators also play a role in modeling responsible digital communication and guiding parents toward healthy media habits at home.
8. **Integration Should Be Seamless and Purposeful:** Successful technology integration occurs when digital tools become a natural part of the learning environment, used to support existing goals rather than distract from them (NAEYC and Fred Rogers Institute). When technology is well-integrated, children’s focus remains on discovery, collaboration, and expression—not the device itself.
9. **Technology Should Encourage Play, Creativity, and Collaboration:** Children’s interactions with technology should be playful and imaginative, mirroring traditional play (NAEYC and Fred Rogers Institute). Digital tools can promote creativity, storytelling, problem-solving, and pretend play—especially when used collaboratively with peers or adults. Interactive games and media should invite children to explore, take control, and engage actively with ideas.

10. Digital Literacy and Digital Citizenship Begin in Early Childhood: Educators have a responsibility to help children begin developing digital literacy—the ability to think critically about technology and media—and digital citizenship, which involves using technology safely, respectfully, and ethically (NAEYC and Fred Rogers Institute). Even young learners can begin to understand concepts like protecting personal information, asking for help online, and making kind choices in digital spaces.

11. Ongoing Professional Development Is Essential: To apply these principles effectively, educators need ongoing training and professional learning in technology integration, digital literacy, and media evaluation. Access to up-to-date resources, hands-on experiences, and communities of practice ensures that teachers can make informed, reflective choices about how technology supports learning and development (NAEYC and Fred Rogers Institute).

The NAEYC and Fred Rogers Institute (2012, 2025) position statement underscores that effective technology use in early childhood is:

- Intentional – guided by learning goals, not convenience.
- Developmentally appropriate – matched to children’s age, needs, and contexts.
- Active and engaging – encouraging exploration and creativity.
- Inclusive and equitable – supporting every child’s access and participation.
- Human-centered – strengthening relationships, not replacing them.

When educators apply these principles, technology becomes not a distraction, but a powerful extension of play, discovery, and connection in the early learning environment.

Recommendations by NAEYC and the Fred Rogers Institute

The NAEYC and the Fred Rogers Institute provide a series of practical recommendations to guide educators in the intentional and responsible use of technology in early learning environments. These recommendations emphasize purposeful integration, balance, and equity—ensuring that technology serves as a tool for development and connection, not distraction or replacement (NAEYC and Fred Rogers Institute, 2012; 2025).

- **Be Intentional and Reflective in Technology Use:** Educators should select, use, and evaluate digital tools with clear learning goals and developmental appropriateness in mind (NAEYC and Fred Rogers Institute). Every choice—from apps and videos to interactive media—should align with a child’s age, abilities, and interests. Equally important is the quality of content and the potential for co-engagement—shared experiences between adults and children that encourage conversation, problem-solving, and joint exploration (NAEYC and Fred Rogers Institute).
- **Maintain a Balanced Learning Environment:** Technology should complement - not replace - hands-on learning, play, and human interaction. NAEYC and the Fred Rogers Institute encourage educators to provide a balance of experiences, integrating digital tools only when they enrich authentic, creative, and active engagement. The goal is for children to remain participants, not passive observers, using technology to extend their curiosity about the world around them.
- **Avoid Passive Media Use for Young Children:** Passive viewing—such as watching television shows, DVDs, or non-interactive videos - should be prohibited for children under age two and strongly discouraged for children ages two through five in educational settings (NAEYC and Fred Rogers Institute). These forms of media lack interactivity and do not promote

cognitive or social engagement. Instead, early learning programs should focus on interactive and hands-on experiences that support growth across all developmental domains.

- **Support Relationship-Based Technology Use for Infants and Toddlers:** When technology is used with infants and toddlers, it should be limited, purposeful, and relationship-centered; acceptable uses may include co-viewing digital photos, reading interactive e-books together, or connecting with family members through video calls (NAEYC and Fred Rogers Institute). These experiences should always enhance communication and strengthen bonds between caregivers and children, not substitute for real-world interaction.
- **Follow Health-Based Screen Time Guidelines:** Educators are urged to consider public health recommendations - such as those from the American Academy of Pediatrics - when determining screen time limits for children from birth through age five (NAEYC and Fred Rogers Institute). Screen time in early learning settings should be coordinated with families to maintain healthy habits across home and school. By working together, educators and parents can ensure that children experience technology in measured, meaningful, and developmentally appropriate ways.
- **Ensure Equitable Access for All Children and Families:** Equity remains a central principle in the NAEYC and Fred Rogers Institute recommendations. Programs should take active steps to provide all children - regardless of background, language, or ability - equal access to high-quality technology experiences (NAEYC and Fred Rogers Institute). This includes ensuring that both children and families have opportunities to use and learn from digital tools that enhance communication, creativity, and connection.

These recommendations underscore that technology use in early learning should always be intentional, interactive, balanced, and equitable. When used with purpose and care, digital tools can support children's exploration, strengthen relationships, and expand access to meaningful learning experiences.

1.5 Benefits of Technology in the Early Childhood Classroom

When used intentionally and aligned with developmentally appropriate practice (DAP), technology and interactive media can make learning multisensory, interactive, and equitable - expanding access to rich experiences for all young learners. The goal is not more screen time, but purposeful experiences that advance specific learning goals while preserving play, relationships, and hands-on exploration (The Children's Museum of Pittsburgh, 2021). So what constitutes technology? According to the NAEYC technology in early childhood education includes computer programs and applications, television, movies, e-books, cell phones, tablets, and broadcast media. The Children's Museum of Pittsburgh, however, adopts a broader view of technology - defining it as any application of scientific principles that helps children learn and solve problems. This perspective encompasses a wide range of tools, from tablets and light tables to circuit blocks, digital microscopes, and other simple materials that allow children to explore cause-and-effect relationships. The goal is not to replace play or human interaction, but to create new opportunities for creativity, connection, and exploration that enhance traditional early learning experiences (The Children's Museum of Pittsburgh).

Physical and Cognitive Development

From a physical development perspective, technology can strengthen fine-motor precision, hand-eye coordination, and reaction time (The Children's Museum of Pittsburgh, 2021). Activities such as tapping keys, swiping screens, moving digital

objects, or manipulating interactive materials like light tables and circuit blocks help children refine dexterity and visual tracking skills. These small but significant motor experiences lay a foundation for later writing, drawing, and tool use. In terms of cognitive development, digital learning environments foster language growth, digital literacy, and information processing (The Children’s Museum of Pittsburgh). E-books and interactive software encourage letter recognition, vocabulary expansion, and pronunciation practice, while multilingual tools expose children to new languages and sounds. Animated, narrated media also support comprehension and memory by connecting visuals, audio, and motion—helping children integrate ideas and make sense of the world (The Children’s Museum of Pittsburgh). As technology becomes more embedded in daily life, these experiences build children’s confidence in navigating digital tools, establishing early digital literacy skills that will serve them in future academic contexts.

While discussions of screen time often focus on sedentary behavior, growing evidence suggests that certain types of digital media can actually promote physical activity and motor development when used intentionally. Ponti (2023) notes that many modern educational apps and games are specifically designed to encourage active play and movement. For example, young children might use a smart speaker to count during a game of hide-and-seek or follow along with digital yoga and dance programs. When digital experiences invite children to move, imitate, or participate, they become extensions of physical play rather than replacements for it. Research shows that interactive or “active” video games - sometimes referred to as *exergaming*—can increase children’s light-to-moderate physical activity, elevate heart rate, and boost overall energy expenditure in short bursts (Ponti). Preschool programs that integrate exergaming or movement-based apps into their routines have found positive effects on children’s motor skills, self-confidence, and enthusiasm for physical activity. Importantly, high-quality educational technologies can also bridge the gap between digital and outdoor

play. Mobile apps that encourage exploration of nature - such as digital scavenger hunts or photo-based observation tools - can motivate children to move, discover, and engage with their environment (Ponti). When used in this way, digital tools support a balanced, active lifestyle by blending on-screen experiences with hands-on, imaginative, and social play.

Learning Benefits

Recent research has shown that digital tools can meaningfully enhance early learning when used interactively and with adult guidance. During the COVID-19 pandemic, many families discovered the developmental value of activities such as virtual story times and video chats, which allowed children - even infants and toddlers - to connect socially and emotionally through shared digital experiences; when parents and children sing together using online videos, play educational games, or co-explore learning apps, technology becomes a medium for bonding and communication rather than isolation (Ponti, 2023). Ponti notes that children as young as preschool age can learn effectively from interactive digital experiences. For instance, dialogic reading over video chat has been shown to support vocabulary development and story comprehension at levels comparable to in-person book sharing. Likewise, according to Vedeckina and Borgonovi (2021), well-designed educational programs and screen-based activities can strengthen language and communication skills for children aged two and older—and are especially beneficial for those from disadvantaged backgrounds. Also for children ages two to four, well-designed, age-appropriate digital content can foster early literacy, language growth, and even imaginative play. Similarly, educational television and interactive e-books have been linked to the development of executive functioning, prosocial behaviors, and creativity (Ponti).

Interactive media, especially those that include timely adult responses and opportunities for back-and-forth engagement, help children make meaningful

connections between words, ideas, and experiences. Research also suggests that “learn-to-read” apps and educational games can enhance sustained attention and provide practice in foundational literacy skills such as letter recognition, phonics, and comprehension (Ponti, 2023). However, while screens can supplement learning, they are most effective when adults actively participate—co-viewing, asking questions, and encouraging discussion. In essence, children learn best not from the screen itself, but from the shared interactions that surround it (Ponti).

Social-Emotional and Psychosocial Benefits

Equally important are the social-emotional benefits of technology when used in developmentally appropriate ways. Open-ended digital tools and tinkering apps invite experimentation and persistence, promoting problem-solving and a growth mindset (The Children’s Museum of Pittsburgh, 2021). Children experience manageable frustration, learn to self-regulate emotions, and take pride in overcoming challenges—core elements of resilience and self-efficacy. Collaborative digital activities, such as co-creating digital stories, documenting shared projects with photos, or exploring virtual simulations, encourage teamwork, communication, and empathy. High-quality educational media can also broaden cultural awareness by allowing children to “bring the world in”—exploring diverse places, people, and traditions that they might not otherwise encounter (The Children’s Museum of Pittsburgh). Further, exposure to thoughtful, age-appropriate content can promote prosocial behaviors by helping children learn cooperation, respect, and nonviolent problem-solving (Vedechkina and Borgonovi, 2021). For younger children, including those under age three, interactive apps and tablet-based activities have also shown promise in nurturing creativity and play (Vedechkina and Borgonovi).

Inclusive and Personalized Education

Recent research highlights the potential of educational technology to expand personalized learning and support for students with a diverse range of learning abilities. Gillespie (2024) explains that educational technology enables teachers to diagnose academic strengths and challenges early, design customized lesson plans, and create differentiated pathways that meet each child's unique developmental needs. Additionally, many digital tools accommodate diverse learning styles, providing adaptable pacing and scaffolding for children who may need extra support or enrichment. For instance, interactive reading apps can tailor text and narration complexity to a child's skill level, fostering confidence while avoiding frustration. Interactive, gamified environments also increase engagement by turning learning into play, sustaining children's attention and focus through color, animation, and narrative-based exploration. Meszaros et al. (2024) note that artificial intelligence (AI)-powered tools can assist in recognizing and supporting social-emotional learning (SEL) by helping children identify and respond to emotions—particularly beneficial for learners on the autism spectrum. These adaptive tools promote empathy, emotional awareness, and self-regulation through interactive and responsive feedback. Digital innovations are also being explored for the early identification of neurodiversity, with potential for detecting early signs of ADHD, dyslexia, and autism based on gameplay patterns and interaction data (Meszaros et al.). Such advancements could lead to earlier interventions, ensuring that children receive timely, individualized support.

Communication and Collaboration with Families

Parental involvement, a key predictor of early academic success, is also enhanced through digital engagement. Technology supports real-time communication and collaboration between teachers, parents, and administrators. Parent portals within educational apps offer insight into classroom activities and child progress,

enabling parents to participate in shared learning experiences at home. This collaboration fosters a sense of continuity between school and home, reinforcing learning outcomes and building trust between educators and families (Gillespie, 2024).

Increased Accessibility

Equally transformative is the global reach and accessibility of digital learning tools. Programs such as UNICEF's *Learning Passport* provide foundational literacy, numeracy, and socio-emotional content to children in underserved or remote areas, bridging educational gaps and ensuring that learning opportunities are not limited by geography or circumstance (Meszaros et al., 2024). These efforts exemplify how digital technology can help achieve equity in early education, granting all children access to high-quality, developmentally appropriate learning materials regardless of background.

When used thoughtfully and with clear learning intentions, technology can serve as a meaningful extension of play, exploration, and human connection in the early childhood classroom. These benefits highlight that digital tools—when integrated within a balanced, developmentally appropriate framework—can enrich children's growth across physical, cognitive, and social-emotional domains. Rather than replacing traditional experiences, technology can complement and deepen them, helping young learners build the skills, confidence, and curiosity they need to thrive in a modern, interconnected world.

Section 1 Conclusion

Technology is no longer an optional supplement to learning—it is an integral part of how children explore, create, and communicate in the modern world. Yet its role in early childhood education must always remain rooted in the same

principles that have guided teaching for generations: developmentally appropriate practice, intentional use, and the central importance of play and relationships. Throughout this section, we have seen that technology, when used with care and purpose, can open new doors for exploration, self-expression, and connection. It can bring the wider world into the classroom, amplify children's creativity, and give educators powerful tools for observation, documentation, and collaboration with families. The NAEYC and Fred Rogers Institute remind us that effective technology use is guided by intentionality, balance, and equity—ensuring that every digital experience strengthens the human connections at the heart of early learning.

As we move into the next section, we will shift focus from the opportunities technology provides to the key concerns and challenges it presents in early childhood settings. These include issues such as screen time, developmental appropriateness, equity of access, and the importance of maintaining healthy, play-based learning environments. By examining these challenges, educators can better navigate the digital landscape and make informed, ethical choices that ensure technology continues to serve children's best interests.

Section 1 Key Terms

Adaptive Learning - Instructional technology that adjusts content, pace, or difficulty based on an individual child's responses and needs.

Augmented Reality (AR) - A technology that overlays digital images, sounds, or information onto the real world through devices such as tablets, phones, or AR glasses.

Biometrics - Technology that collects and interprets physical or behavioral data—such as facial expressions, heart rate, or movement—to provide insights into a child's engagement or emotional state.

Coding Robot - A programmable device designed to help young children learn sequencing, cause-and-effect, and basic computational thinking through hands-on play.

Co-Engagement - Shared interaction between an adult and child while using technology, such as exploring an app or reading an e-book together, which promotes learning and conversation.

Developmentally Appropriate Practice (DAP) - An approach to teaching grounded in child development research, individual needs, and cultural context, used to guide decisions about appropriate technology use.

Digital Citizenship - The ability to use technology responsibly, safely, and ethically—including following rules, showing kindness online, and protecting personal information.

Digital Literacy - Skills that help children understand, use, and engage with digital tools and media, including navigating apps, understanding symbols, and making meaning from multimedia content.

Digital Microscope - A technological tool that allows children to view magnified images on a screen, supporting observation and scientific inquiry.

Digital Portfolio - A digital collection of children's work—photos, videos, drawings, or recordings—used to document learning and share progress with families.

Exergaming - Interactive digital games or apps that encourage movement and physical activity, supporting motor development.

Hornbook - A wooden paddle used in Colonial American classrooms that displayed printed letters or verses, one of the earliest instructional tools.

Interactive Media - Digital tools—such as apps, e-books, or games—that require children’s active participation through tapping, dragging, speaking, or problem-solving.

Light Table - A translucent, illuminated surface used for exploring color, shadow, patterns, and materials; considered a form of technology when used for inquiry and creative play.

Magic Lantern - A 19th-century projection device that displayed images on a wall or screen, representing an early form of visual instruction technology.

Multi-Touch Surface - A digital interactive table or workstation that allows multiple children to manipulate digital objects simultaneously through touch.

NAEYC (National Association for the Education of Young Children) - A leading professional organization that provides research-based guidelines, including its official position on technology in early childhood programs.

Screen Time - The amount of time a child spends using digital screens; often discussed in relation to recommended limits and developmental appropriateness.

Skinner Teaching Machine - A 1950s device that delivered instructional prompts, practice, and immediate feedback—an early model of individualized, self-paced learning.

Touchscreen - A digital display that responds to finger taps and swipes, commonly used in tablets and early childhood educational apps.

Virtual Storytelling - The use of digital tools—such as interactive e-books, video narration, or multimedia platforms—to support children’s narrative and literacy development.

Voice-Enabled Technology - A device or tool, such as a smart speaker, that responds to spoken commands, enabling hands-free interaction for learning and play.

Section 1 Reflection Questions

1. Think back to your earliest experiences with technology as a learner. How do those experiences influence how you approach technology with young children today?
2. What emerging technologies (AI, AR, biometrics, multi-touch surfaces) excite you the most, and why? Which raise concerns?
3. Where do you see the biggest gap between how technology *could* be used in early learning and how it is currently used in your classroom or school?
4. Reflect on the NAEYC and Fred Rogers Institute's emphasis on intentionality. How do you decide whether a digital tool is appropriate for your learners?
5. Which myths about technology in early childhood have you encountered among colleagues or families, and how have you addressed—or could you address—them?
6. Consider a digital tool you use regularly. How well does it align with developmentally appropriate practice (DAP)? What might you adjust?
7. Think about a child in your classroom who struggles with traditional learning tasks. How might adaptive or interactive technology support the student's learning in new ways?
8. What responsibilities do educators have in helping children begin to develop early digital citizenship skills? How do you approach this in your classroom?

9. Choose one technological trend or tool from the reading. In a few sentences, reflect on how it might reshape early childhood education over the next decade.

Section 1 Activities

1. **Family Communication Plan:** Develop or refine a plan for using digital portfolios, photos, or classroom apps to strengthen home-school connections.
2. **Observe and Document Engagement:** Conduct a short observation of how children interact with a digital tool. Note engagement levels, collaboration, problem-solving, and physical interaction.
3. **Myth-Busting Poster:** Design a simple classroom or staffroom infographic highlighting common myths about early childhood technology and the realities supported by research.
4. **Assistive Tech Exploration:** Research one assistive technology tool that could support children with diverse needs, and summarize how it could be used in your program.
5. **Collaborative Planning Conversation:** Interview a colleague about approaches to technology integration and compare similarities and differences with your own.
6. **Evaluate a Digital Resource for Equity:** Choose a digital tool and analyze whether it is accessible for dual language learners, children with disabilities, and families with limited technology access.

7. **PBS Kids Resource Exploration:** Explore PBS Kids videos, apps, or lesson plans and curate a list of three resources that align with a topic you currently teach.
8. **Assess Personalized Learning Potential:** Review one interactive or adaptive tool and determine how it could offer individualized pathways for a child who needs either enrichment or extra support.

Section 2: Addressing Key Concerns in Early Childhood Digital Practices

As technology becomes increasingly integrated into early learning environments, educators face the challenge of balancing innovation with developmental responsibility. While digital tools offer opportunities for creativity, engagement, and personalized learning, they also raise critical concerns about overuse, equity, safety, and the potential erosion of hands-on, play-based experiences. For young children—whose brains, bodies, and social skills are still developing—how technology is used matters far more than how much it is used. This section explores the most significant issues surrounding technology use in early childhood education, including the effects of screen time on development, disparities in digital access, the importance of protecting children’s privacy and online safety, and the need to maintain balance between technology and real-world exploration. Drawing on recent research and best practices, it provides educators with strategies to ensure that technology serves as a meaningful supplement - not a substitute - for play, interaction, and human connection in the classroom.

2.1 Screen Time and Developmental Health

Digital tools can enhance early learning when used intentionally, but excessive or unbalanced screen time remains one of the most frequently cited concerns in early childhood education. Research continues to show that over-reliance on screens can affect multiple aspects of a young child’s development—particularly when digital interaction replaces hands-on exploration or face-to-face connection.

Over-Reliance on Devices

As Gillespie (2024) explains, excessive use of technology can reduce essential in-person engagement between teachers and students, limiting opportunities for communication and relationship-building. Early childhood is a period when children learn through rich social interactions—by reading facial expressions, interpreting tone of voice, and responding to others’ emotions. When digital engagement takes precedence over human connection, children may miss valuable practice in social cues, emotional regulation, and interpersonal communication. These early relational experiences lay the foundation for empathy, cooperation, and resilience; without them, children may struggle later with emotional awareness and peer relationships.

This is why it is critical that technology use in early childhood classrooms does not diminish the role of human connection, but rather strengthens it. The most meaningful digital experiences are those that encourage interaction, collaboration, and shared discovery between children and adults (Ponti, 2023). When educators intentionally integrate technology as a tool for communication—such as co-viewing digital stories, documenting play together, or using interactive platforms to extend discussions—it becomes a bridge rather than a barrier. These experiences allow children to see technology as part of a relationship-based learning process, where curiosity, empathy, and engagement remain at the center.

In this way, technology enhances social and emotional learning rather than isolating children from the very relationships that nurture their growth (Ponti).

Potential Cognitive and Developmental Impacts

Research continues to suggest that excessive or unbalanced screen exposure during the early years can impact key areas of cognitive and language development. According to Ponti (2023), one of the most closely studied concerns is the relationship between screen time and language delay in preschool-aged children. A recent meta-analysis found that greater amounts of screen exposure—including background television—during infancy are linked to lower language skills by ages three to four. Studies consistently show that children who spend more time in front of screens, whether televisions or tablets, often demonstrate delayed vocabulary growth and weaker grammar development compared to peers with less exposure (Ponti). A Canadian study cited by Ponti also revealed a significant negative relationship between mobile device use and expressive language in children as young as 18 months. These findings suggest that passive or unmonitored screen time may interfere with opportunities for verbal interaction—moments that are critical for building communication and comprehension skills.

While evidence on attention-related outcomes is more mixed, emerging research points to potential risks. Ponti (2023) notes that cumulative exposure to multiple media forms—such as TV, tablets, and smartphones—has been associated with reduced focused attention in toddlers. Because focused attention forms the foundation for later executive functioning, including problem-solving, self-regulation, and working memory, early disruptions to these processes could have long-term developmental implications. For these reasons, educators must be mindful of balancing digital engagement with direct human interaction, ensuring that technology supports rather than substitutes core experiences like conversation, play, and hands-on exploration.

Social Skills

Excessive reliance on digital media, including games and learning applications, can inadvertently limit the face-to-face interactions that are vital for developing empathy, communication, and emotional intelligence. Meszaros et al. (2024) explain that children who spend large amounts of time engaging with digital devices often demonstrate delays in both social and linguistic development. These challenges arise because extended screen use can displace opportunities for rich, reciprocal interactions—like collaborative play, shared storytelling, and peer conversations—that help children interpret social cues, express feelings, and build language proficiency. The effects of overuse are particularly concerning in infancy and toddlerhood, when relationships with caregivers lay the foundation for secure attachment and emotional regulation. Meszaros et al. found that infants exposed to frequent screen use without adult mediation were more likely to develop insecure attachment patterns, highlighting how passive or unsupervised digital engagement can disrupt bonding and trust. To mitigate these risks, educators and families must intentionally balance digital experiences with real-world social interactions. Encouraging co-use—where adults participate in or guide children’s technology use—can transform screen time into a shared, interactive experience that reinforces connection and communication rather than replacing it.

Physical Health

According to Ponti (2023), the most consistent health concerns linked to early and prolonged screen exposure include sedentary behavior, disrupted sleep patterns, and risks associated with poor posture and visual strain. Although studies show that screen time alone may not directly cause significant weight gain in preschoolers, early habits of inactivity often persist into later life, contributing to long-term risks for obesity and other health issues. A 2017 systematic review also found correlations between screen use and various health indicators such as

adiposity, reduced motor and cognitive development, and poorer psychosocial outcomes (Ponti). Excessive screen time can also interfere with the development of fundamental motor skills and fine motor control. For example, higher amounts of screen exposure in preschool-aged children—particularly in boys—have been associated with weaker performance in manual dexterity and lower scores on standardized motor assessments (Ponti). This indicates that time spent passively engaging with screens may replace opportunities for movement, play, and exploration that are vital for physical and neurological growth. Similarly, commercial television can influence poor eating habits by exposing children to advertisements for unhealthy foods, encouraging snacking, and distracting parents from responsive feeding practices. When caregivers are occupied with their phones during mealtimes, children may consume more calories or resist trying new, healthy foods, increasing the risk of disordered eating patterns (Ponti).

Sleep quality is another area of growing concern. Research has consistently shown that screen use—especially before bedtime—disrupts children’s sleep cycles, leading to later bedtimes, reduced total sleep duration, and greater bedtime resistance (Ponti, 2023). The blue light emitted from screens can suppress melatonin production, delaying sleep onset and reducing restfulness. These effects are compounded when screens are present in children’s bedrooms, as the stimulation and light exposure interfere with natural circadian rhythms (Ponti). Prolonged device use can also contribute to eye strain and increase the likelihood of myopia, a growing concern as children spend less time outdoors (Ponti). To promote healthy habits, experts suggest structured screen breaks, frequent opportunities for active play, and ergonomically designed learning spaces.

Not All Technology-Related Activities are Created Equal

While these findings underscore legitimate concerns, it is important to recognize that *not all technology use carries the same risks*. In fact, the effects of screen

time depend heavily on both the *content* and the *context* of use. As Vedeckina and Borgonovi (2021) explain, research reveals that by age three, children have developed the ability to attend to and comprehend age-appropriate digital content—meaning they can learn from educational media when it is well-designed and actively mediated by adults. The inconsistency in research findings about screen time’s impact on attention and cognition can often be traced to the quality of programming and the way it is experienced; for example, entertainment television before age three has been linked to poorer attention outcomes, while educational programming has not shown such effects (Vedeckina and Borgonovi). In fact, evidence suggests that high-quality educational media—designed with clear learning goals, appropriate pacing, and meaningful engagement—can support the development of language, problem-solving, and social skills.

This distinction underscores a key principle for early childhood educators: quality matters more than quantity. The content’s purpose, pacing, and interactivity—as well as whether it is experienced alone or with an adult—significantly influence developmental outcomes (Vedeckina and Borgonovi, 2021; Ponti, 2023). Co-viewing, or engaging in digital experiences together, allows adults to reinforce concepts, connect screen-based ideas to real-world experiences, and model reflective thinking. In this way, educators and parents can transform technology from a passive activity into an interactive learning experience. Ultimately, the goal is not to eliminate screen use, but to ensure it aligns with developmentally appropriate practice. This includes balancing digital learning with physical play, conversation, and creative exploration (Vedeckina and Borgonovi). When educators prioritize meaningful, guided engagement and carefully select age-appropriate content, technology can support—rather than hinder—healthy cognitive and social development in early childhood.

2.2 Equity and Access in the Digital Divide

The term *digital divide* refers to the gap between those who have sufficient access to technology (devices, connectivity, adult support) and those who do not (Organisation for Economic Co-operation and Development [OECD], 2025). As the OECD explains, this includes disparities not only in hardware and broadband but also in the skills to use technology meaningfully, and the motivation and support to engage in digital learning. In early childhood contexts, children who lack home devices, reliable internet, or adult guidance may begin at a disadvantage: the promise of digital tools to enhance learning is not realized when access and support are missing. For example, a report by the U.S. Department of Education (2022) emphasised that infrastructure, affordability and adoption all matter in closing the access gap. When young children attend early learning environments where digital tools are scarce or poorly supported, the divide can reinforce existing inequities in language, literacy, and school readiness.

Socioeconomic and Cultural Factors

Disparities in digital access often reflect socioeconomic and geographic realities that schools must contend with. Students in low-income districts or rural schools are more likely to attend classes where there is inconsistent device availability, outdated hardware, or slow internet (Graves et al., 2021). Language and cultural factors also intersect with technology access: in schools with many multilingual learners, digital tools may not reflect students' home languages or cultural experiences, which reduces meaningful engagement and equitable participation. One policy brief by American Progress emphasizes this “digital design divide” alongside device and connectivity inequities (DeMio, 2024). Within schools, when students arrive with vastly different levels of home support, device familiarity, or internet reliability, the expectation that every student can “log on and learn” becomes unrealistic (DeMio). Educators must therefore interpret technology

access as an extension of equity work—not just hardware provisioning. Essentially, the early learning gap begins long before kindergarten—and without intervention, it can influence a child’s lifelong academic and social success (Johnson, 2025).

Bridging the Gap: Programs and Initiatives

In Greater Houston, nearly half of children enter kindergarten unprepared, a statistic that underscores how inequities in access to technology and quality early learning resources can perpetuate disadvantage (Johnson, 2025). While schools play a critical role in providing access to digital tools and instruction, meaningful progress in closing the digital divide often requires partnerships that extend beyond the classroom. The nonprofit Collaborative for Children offers a strong example of how communities can take innovative steps to bridge this gap.

Recognizing that digital equity means more than simply distributing devices, the organization created Centers of Excellence—early learning environments that integrate educational technology in developmentally appropriate ways. These centers use interactive tools and AI-driven platforms to personalize instruction, helping teachers adapt lessons to individual learners while avoiding excessive screen time (Johnson).

To reach families outside of traditional classrooms, Collaborative for Children developed the Collab-Lab, a mobile learning hub that brings hands-on STEM activities, digital literacy workshops, and learning materials directly to neighborhoods, parks, and community events (Johnson, 2025). This model ensures that children in under-resourced communities have access to high-quality learning opportunities where they live, not just where they attend school.

Recognizing that digital inclusion must also extend to the home, the organization partnered with T-Mobile to distribute Wi-Fi hotspots to families without reliable internet access. This initiative has allowed children to participate in virtual storytimes, explore online educational games, and strengthen parent-child

engagement through digital learning tools (Johnson). Connectivity is no longer a luxury—it is a prerequisite for equitable learning.

Collaborative for Children’s approach demonstrates how schools and community organizations can collaborate to ensure that all children—regardless of socioeconomic status or geographic location—have the resources needed to succeed. By pairing access to technology with high-quality instruction, family engagement, and strong community partnerships, such programs model how local efforts can serve as scalable solutions to national challenges. As Johnson (2025) notes, closing the digital divide for young learners is not only about equal access to devices—it’s about creating equitable pathways to lifelong opportunity.

2.3 Protecting Children’s Privacy and Digital Safety

Young children, in particular, are highly vulnerable to data misuse, online exposure, and inappropriate content due to their limited ability to recognize risk or navigate digital environments safely. According to Meszaros et al. (2024), cybersecurity and data privacy are among the most pressing issues in digital learning for young children. Many educational apps and online platforms collect personal information—such as names, location data, and usage patterns—that can be misused if adequate protections are not in place. Although the Children’s Online Privacy Protection Act (COPPA) in the United States and the General Data Protection Regulation (GDPR) in Europe provide important legal frameworks to protect minors’ data, enforcement across digital platforms remains inconsistent (Meszaros et al.). Some applications marketed for educational use fail to meet even basic privacy standards, putting children’s personal information at risk of being shared, sold, or breached. For this reason, educators and caregivers must take proactive steps—such as carefully reviewing app permissions, verifying compliance with COPPA and GDPR, and choosing only vetted, secure platforms for

classroom or home use. Schools can also strengthen privacy safeguards by establishing clear data protection policies, educating staff about digital ethics, and collaborating with parents to monitor children’s online activity (Meszaros et al.).

Gillespie (2024) adds that, beyond privacy risks, exposure to inappropriate or harmful online content remains a serious concern. Even with school firewalls, children can inadvertently encounter disturbing, violent, or age-inappropriate material. Such exposure can have lasting emotional and psychological effects. Teachers and parents must therefore remain vigilant, ensuring that digital tools are developmentally appropriate and free from unsafe content (Gillespie).

Teaching Internet Safety in Early Childhood Classrooms

As young children increasingly explore, learn, and play in digital environments, early childhood educators have a critical role in teaching foundational internet safety skills. While preschoolers and early elementary students may not yet navigate the internet independently, early exposure to responsible digital habits sets the stage for lifelong online safety. According to The Annie E. Casey Foundation (2025), both teachers and families can help protect children and guide them toward responsible digital behavior through intentional instruction and modeling in the classroom. Early internet safety education should begin with simple, concrete lessons that match children’s developmental stage. Teachers can model and discuss what it means to be *safe*, *kind*, and *responsible* online—concepts that parallel classroom expectations for in-person behavior (Annie E. Casey Foundation). For example, educators can use storytelling or role-play to show how to recognize when something feels uncomfortable online and how to ask a trusted adult for help. Establishing this link between online and real-world safety helps children see technology use as part of their overall social learning (Annie E. Casey Foundation).

Key Internet Safety Practices for Early Learners

Drawing on recommendations from The Annie E. Casey Foundation (2025), the following strategies can guide educators in developing lessons and routines that promote digital safety in school settings:

- **Be smart about passwords.** Teach children that passwords are like “digital keys” that keep their accounts and devices safe. Encourage them to use strong, creative passwords that include numbers and symbols, and remind them that only trusted adults—like a parent or teacher—should know them.
- **Check privacy settings.** Educators should ensure that all classroom devices have privacy settings enabled, location tracking turned off, and data collection minimized. When introducing new apps or websites, teachers can demonstrate how privacy settings protect users, helping children begin to understand the concept of personal data.
- **Research before use.** Before adding new educational apps or websites, teachers should review content ratings through reliable resources such as *Common Sense Media* to verify that materials are age-appropriate, ad-free, and aligned with the school’s values. Educators can also involve children in evaluating media—asking whether a game or video helps them learn or simply distracts them.
- **Pause and ask.** Reinforce the habit of “stop and ask” whenever something unexpected happens online. Children should know that if they encounter a pop-up, a request for information, or an unfamiliar image, they should stop and tell a teacher or adult before proceeding.

- **Avoid pop-ups and clickbait.** Children can be shown examples of what “clickbait” looks like and why it’s important to avoid tapping unfamiliar links or online offers.
- **Stay unseen and secure.** Remind children that webcams and microphones should only be used with permission. Teachers can model good habits by keeping classroom device cameras covered when not in use.
- **Use safe search and parental controls.** Schools should enable safe search filters on all classroom devices and establish strict browsing limitations to prevent exposure to inappropriate content. Additionally, screen time should be balanced with physical and social play to promote healthy habits.
- **Keep technology visible.** In classrooms, digital devices should be placed in central areas where teachers can supervise activity. This allows adults to model and monitor online behavior while promoting transparency and accountability.
- **Be cautious about online friendships.** Even in early learning contexts, digital games and educational platforms can include social features. Educators should teach children the difference between real-life friends and “online-only” acquaintances, emphasizing that they should never share personal information—such as their full name, photo, or address—with anyone online.
- **Update regularly.** Keeping classroom devices, apps, and browser essential to prevent security vulnerabilities. Teachers can make this a routine “digital safety check,” involving children in the process as a way to reinforce responsibility for shared tools.

Internet safety should not be treated as a one-time lesson but as an ongoing part of the school culture. Educators can integrate these skills into digital literacy

activities, such as co-viewing educational videos, discussing online behavior during circle time, or reading storybooks about technology use and safety. Collaborating with families is equally important—schools can send home safety checklists or host short workshops that help parents reinforce these same principles at home.

Tools for Teachers to Support Student Digital Safety

In an early learning environment, teachers play a critical role in ensuring that children explore digital spaces safely. As classroom technology use increases, educators can take advantage of several tools designed to monitor, filter, and guide online activity. According to The Annie E. Casey Foundation (2025), the following tools and resources can help teachers and schools maintain safe, age-appropriate digital environments:

- **Apple Screen Time:** Allows adults to set up content and privacy restrictions on iPads or iPhones. Teachers or administrators can block explicit content, prevent app downloads, adjust privacy settings, and set daily screen time limits to encourage balanced use.
- **YouTube Safety Settings:** Offers two child-friendly viewing modes—Explore (ages 9+) and Explore More (ages 13+)—to limit access to age-appropriate content. For younger learners, the YouTube Kids app provides curated videos for three age ranges: under 4, ages 5–8, and ages 9–12.
- **ScreenSense:** A nonprofit organization that provides comprehensive resources for schools and families on healthy tech use. It offers reviews and step-by-step guides for using parental controls across various platforms, including web browsers, streaming services, social media, and gaming consoles.
- **Common Sense Media:** A trusted resource that reviews and rates apps, websites, movies, and games for age-appropriateness and educational

value. Educators can use Common Sense Media's *Digital Citizenship Curriculum* to teach students how to stay safe, think critically, and act responsibly online. The site also provides family engagement guides and privacy evaluation tools to help schools select safe, effective educational technologies.

- **GoGuardian:** A classroom management and digital safety tool used in schools to monitor student activity on school-issued devices in real time. It allows educators to filter inappropriate content, close distracting tabs, and protect students from online risks while maintaining a focus on learning. GoGuardian also provides data insights that help schools understand and address students' digital behavior responsibly.

When paired with classroom instruction on digital citizenship, these tools help educators create environments that balance innovation with safety. By combining effective technology management with active supervision and open communication, teachers can protect young learners while fostering responsible, confident engagement with digital tools.

2.4 Balancing Technology with Play and Exploration

Another common concern among early childhood educators is that technology might replace hands-on learning—the foundation of early development. Play, exploration, and tactile engagement are how young children make sense of the world, and excessive reliance on screens risks reducing these critical, sensory experiences. While digital tools can offer powerful learning opportunities, young children still thrive best when technology is balanced with tactile, real-world experiences. Research emphasizes that meaningful learning occurs when digital engagement is combined with active participation and human interaction (Meszaros et al., 2021). Simply placing a device in a child's hands is not enough—

true educational value emerges when technology use is guided, contextualized, and connected to real-world exploration. Blending digital learning with hands-on experiences allows children to make deeper cognitive and emotional connections. Continuous adult interaction during technology use—whether from a teacher in the classroom or a parent at home—reinforces understanding and builds social skills. Co-engagement, such as discussing the content of a digital story or the challenges of a learning game, helps children interpret what they see, ask questions, and apply new concepts meaningfully (Meszaros et al.). For example, when an educator sits beside children using a literacy app and prompts them to predict story outcomes or relate characters to their own experiences, the learning shifts from passive screen time to an active, relational exchange.

Choosing tools that combine tactile, visual, and auditory elements also supports multiple aspects of development (Meszaros et al., 2021). Products like Osmo, which merge physical objects with digital gameplay, encourage children to manipulate real materials while engaging with digital feedback. This integration promotes problem-solving, creativity, and fine-motor coordination, ensuring that digital play remains grounded in sensory-rich, hands-on exploration (Meszaros et al.). Although Osmo's parent company, Byju's, has undergone bankruptcy proceedings, many of its kits remain available online through major retailers, demonstrating the lasting appeal of hybrid learning tools.

For educators, the goal is not to replace traditional play with technology but to weave it into a well-rounded learning environment. This means using digital tools to extend classroom lessons, introduce new perspectives, or document hands-on activities—without diminishing opportunities for movement, creativity, or collaboration. When used intentionally and paired with human connection, technology can enhance rather than compete with the essential, play-based foundations of early learning.

Section 2 Conclusion

Technology can be a transformative force in early childhood education—but only when used with intention, balance, and awareness of its risks. As this section has shown, digital tools must be integrated in ways that protect children’s well-being, promote equity, ensure privacy, and preserve the vital role of hands-on exploration. Educators play a pivotal role in modeling responsible digital behavior, guiding children through safe and enriching online experiences, and ensuring that learning remains active, relational, and developmentally appropriate. The next section will build on these principles by helping educators identify high-quality, research-based technologies that support early learning goals. It will outline practical strategies for assessing content quality, age-appropriateness, accessibility, and alignment with play-based pedagogy—ensuring that every digital choice strengthens, rather than compromises, the foundations of early education.

Section 2 Key Terms

Adiposity - A measure of body fat accumulation that can be influenced by sedentary behavior and unhealthy media habits in early childhood.

Attachment Patterns - Emotional bonds formed between infants and caregivers; these can be disrupted by excessive, unmediated screen exposure.

Children’s Online Privacy Protection Act (COPPA) - A U.S. law that governs the online collection and use of personal information from children under 13.

Clickbait - Online content designed to attract clicks through misleading images or headlines, which young children may mistakenly engage with.

Digital Divide - The gap between individuals or communities with adequate access to technology, connectivity, and digital skills and those without.

Digital Safety - Practices and policies that protect children from privacy risks, exposure to inappropriate content, and unsafe online interactions.

Executive Functioning - A set of cognitive skills—including attention, working memory, and self-regulation—that may be affected by excessive or low-quality screen exposure.

General Data Protection Regulation (GDPR) - A European Union regulation that outlines strict rules for data protection and privacy, including guidelines for children's digital information.

Insecure Attachment - A pattern of weaker or disrupted bonding between a child and caregiver; research links it to excessive screen use without adult interaction in infancy.

Language Delay - Slower-than-typical development of expressive or receptive language skills; associated with high levels of passive or unmonitored screen exposure.

Media Mediation - The practice of adults actively engaging with children during digital media use to support understanding, language development, and safety.

Motor Development - Growth of fine and gross motor skills that can be hindered when screen use replaces physical play and exploration.

Myopia - Nearsightedness that can worsen with prolonged screen exposure and reduced time outdoors.

Privacy Settings - Controls that limit how much personal data apps or devices collect, store, and share; essential for protecting children's digital information.

Safe Search Filters - Digital tools that block access to inappropriate or unsafe online content when children browse the internet.

Sedentary Behavior - Low levels of physical movement commonly associated with passive screen use and linked to long-term health risks.

Social-Emotional Development - Growth of skills related to empathy, communication, and emotional regulation, which can be affected when technology replaces relational experiences.

“Stop and Ask” Strategy - A safety habit taught to young children that encourages them to pause and seek adult help whenever uncertain or uncomfortable online.

Section 2 Reflection Questions

1. Think about a time when technology appeared to replace a hands-on or social learning opportunity. What happened, and what might you do differently now?
2. How do you communicate screen time expectations or guidelines to families? What challenges or successes have you experienced in those conversations?
3. Which developmental concerns discussed in this section (language delay, reduced attention, social-emotional impact, sleep disruption, etc.) feel most relevant to the children you currently teach? Why?
4. Think about your school or community context. Where do you see the digital divide impacting children or families most tangibly?
5. Which equity initiatives or partnerships (such as mobile learning labs, hotspots, or community centers) do you believe would make the biggest difference in your setting, and why?

6. Describe the privacy and security measures your program currently uses (e.g., safe search filters, app vetting, device restrictions). What gaps still exist?
7. How do you teach young children foundational internet safety skills in developmentally appropriate ways? What strategies have worked well?

Section 2 Activities

1. **Screen Time Inventory:** Track all digital media use in your classroom over three days and categorize it as passive, interactive, or co-engaged. Reflect on the balance.
2. **Classroom Privacy Check:** Review device settings, app permissions, and privacy controls on all classroom devices. Document what needs adjustments.
3. **Community Equity Research:** Investigate one local organization (library, nonprofit, community center) that can help bridge digital access gaps for families.
4. **Internet Safety Mini-Lesson:** Design a short instructional activity teaching “stop and ask,” password safety, or another early digital citizenship skill.
5. **Language Interaction Audit:** Observe a 20-minute period of technology use and count verbal interactions between children and adults. Analyze whether technology is supporting or reducing language opportunities.

Section 3: Evaluating and Selecting Digital Tools in Early Learning

As technology continues to shape how children learn and communicate, early childhood educators face the critical task of determining which digital tools genuinely support developmentally appropriate learning. The goal is not to use more technology, but to use it wisely and purposefully - selecting tools that enrich play, inquiry, creativity, and connection. With thousands of educational apps and platforms available, teachers need clear criteria and evidence-based frameworks to evaluate quality, safety, and educational impact. This section provides a foundation for making informed decisions about technology in early learning settings. It explores how to identify high-quality digital learning tools, ensure they align with developmental needs, and apply structured frameworks - such as ISTE's *Teacher Ready Evaluation Tool*, Kolak's *Tool for Evaluating the Educational Potential of Preschool Apps*, and Kolb's *Triple E Framework*. Together, these tools offer educators practical ways to assess technology's effectiveness, ensuring it complements—rather than competes with—hands-on, play-based learning.

3.1 Purposeful Technology in Early Learning

As digital tools become increasingly present in early childhood classrooms, the role of technology must be reframed—not as a replacement for play, exploration, and interpersonal connection, but as a powerful enhancer of these foundational experiences. Technology, when used intentionally and developmentally appropriately, can deepen engagement, extend inquiry, and support creative expression. The goal is not to introduce more screens, but to use digital tools purposefully to foster curiosity, collaboration, and discovery. For technology use in early learning to be effective, three elements are essential (Waite, 2025):

- **Intent:** Educators should select technology with clear learning purposes, ensuring that tools support children’s natural curiosity and developmental needs. Technology should never be used for its own sake but as a means to deepen understanding and engagement (Waite). Each digital experience should connect directly to instructional goals—such as promoting problem-solving, encouraging communication, or extending a child’s interests into new learning domains. For example, an app that lets children create digital stories or explore patterns through interactive design can enhance creative expression while reinforcing literacy or math concepts.
- **Implementation:** Effective integration requires balancing child-led exploration with thoughtful educator guidance. Digital activities should remain playful, active, and inclusive, offering multiple ways for children to participate according to their interests, learning styles, and abilities (Waite). This means embedding technology into the classroom environment as one of many available learning tools—alongside blocks, art materials, and dramatic play centers. Educators can facilitate rich experiences by prompting reflection (“What do you notice?”), encouraging collaboration (“Can you work together to solve that?”), and connecting digital exploration to real-world experiences (“Can we find this pattern outside?”).
- **Impact:** When implemented well, technology in early childhood education enhances engagement, builds confidence, promotes digital literacy, and strengthens problem-solving skills. Children gain experiences that prepare them not only for school but for the technology-rich world they are evolving in (Waite). Beyond skill development, purposeful digital engagement helps children see themselves as creators, not just consumers of technology. They learn that devices are tools for imagination, communication, and inquiry—extending their ability to explore and express ideas.

When these three elements - intent, implementation, and impact - work in harmony, technology becomes a meaningful extension of early learning rather than a distraction from it. By grounding digital experiences in curiosity, creativity, and connection, educators ensure that technology serves the child, not the other way around. Purposeful integration encourages children to think critically, collaborate with others, and explore the world through multiple modalities. In this way, technology fulfills its highest purpose in early education: to enrich play, deepen understanding, and empower young learners to become confident, capable participants in an increasingly digital world.

3.2 Criteria for High-Quality Early Digital Learning Tools

When selecting digital tools for early childhood classrooms, educators should apply clear criteria to ensure those tools contribute positively to children's development, learning, and well-being. Below are key criteria drawn from recent research and best practices in early childhood technology use.

Active Involvement

High-quality educational apps engage both the body and the mind through interactive, multisensory experiences that align directly with clear learning objectives (Kolb, 2025). Active involvement is one of the most essential indicators of a high-quality educational app, especially in early childhood education. Young children learn best through doing—touching, moving, experimenting, and responding to what they see and hear. Therefore, digital tools should not position children as passive consumers of information but instead invite them to become active participants in their own learning (Kolb). Effective applications require children to physically interact—through swiping, tapping, dragging, or typing—and to mentally engage through higher-level cognitive processes such as predicting, analyzing, and comparing outcomes. For example, rather than simply

tapping a character to make it move, a purposeful app might ask children to sequence steps in a story, match patterns, or adjust variables to solve a challenge (Kolb). These small physical interactions, when guided by meaningful cognitive demands, reinforce fine motor skills while promoting active reasoning and reflection. As Kolb notes, the key to designing or selecting such tools is ensuring that every interaction serves a pedagogical purpose—each action should bring the learner closer to a developmental or instructional goal rather than functioning as entertainment filler.

Active involvement also supports deeper cognitive engagement by encouraging children to think critically about cause and effect. Well-designed apps give children opportunities to test hypotheses (“What happens if I move this here?”), see the results immediately, and adjust their thinking accordingly. This process of experimentation mirrors the scientific method and nurtures problem-solving and persistence—skills that extend far beyond the digital space (Kolb, 2025). For instance, when children manipulate shapes, letters, or numbers on a touchscreen, they are not only practicing content knowledge but also developing executive functioning skills like planning, organization, and self-monitoring. An excellent example of this principle in practice is SolveMe Math Puzzles, an interactive platform designed for children as young as 6-years-old, who solve visual math challenges by dragging and balancing equations on the screen. Learners are required to test problem-solving strategies, apply deductive reasoning, and even create their own puzzles using provided templates (Kolb). This type of engagement promotes both physical interaction and cognitive rigor—children are not just observing mathematical relationships but actively constructing them.

Meaningful Connections

High-quality digital tools should connect directly to children’s real-world experiences, helping them transfer knowledge from screen to life. When apps

include familiar settings, objects, and situations, they make learning more relevant and memorable. As Kolb (2025) explains, digital tools grounded in authentic contexts—those that mirror children’s daily environments and interests—support deeper understanding and sustained engagement. For example, iNaturalist encourages children to photograph and identify local plants or animals, linking technology with observation and environmental awareness. This type of real-world inquiry helps young learners see how science applies to their surroundings. Similarly, Design Squad Global (PBS) offers project-based engineering challenges, such as designing solar-powered playhouse features, that promote problem-solving and creativity while connecting digital activities to tangible outcomes (Kolb). When digital experiences align with children’s lives and communities, they strengthen motivation, comprehension, and long-term learning (Kolb). Educators can enhance these benefits by selecting tools that feature authentic examples, cultural inclusivity, and local relevance. Meaningful connections ensure that technology supports—not replaces—the natural exploration and real-world discovery essential to early learning.

Social Interaction

Learning in early childhood is inherently social, and as highlighted previously, digital tools should reinforce—not replace—human interaction. High-quality educational apps encourage children to communicate, collaborate, and reflect together, supporting both cognitive and social-emotional growth (Kolb, 2025). When technology promotes back-and-forth dialogue—whether with peers, adults, or responsive characters—it deepens understanding and strengthens social development. Tools like Seesaw and Padlet allow children to share their work, comment on peers’ creations, and engage in teacher-guided discussions, fostering classroom collaboration and communication skills. Similarly, the Hello History app provides a safe, FERPA-compliant environment where students can converse with

historical figures, encouraging curiosity and perspective-taking through guided, conversational learning (Kolb). Applications lacking interactivity or opportunities for dialogue can unintentionally isolate learners. In contrast, those designed for social engagement help children co-construct knowledge, practice empathy, and connect digital learning to real-world relationships (Kolb).

Accessibility

Accessibility and usability are essential elements of high-quality educational technology. For digital tools to truly serve all learners, they must be intuitive, inclusive, and adaptable to a wide range of abilities and developmental stages. A well-designed interface uses simple icons, minimal text, and clear navigation suited to preschool and early-elementary learners. Studies show that usability is one of the strongest predictors of engagement and learning outcomes (Vaiopoulou et al., 2022). When children can navigate an app independently and intuitively, they are more likely to stay focused, explore content meaningfully, and persist through challenges. As Kolb (2025) notes, effective engagement stems from active participation—allowing children to manipulate, create, and problem-solve through purposeful play rather than passive tapping or point scoring.

Equally important is inclusive design. Digital tools must provide built-in accessibility features so that children with physical, cognitive, or sensory differences can participate fully and independently (Kolb, 2025). This includes keyboard navigation and compatibility with assistive technologies such as speech recognition, head pointers, or eye-gaze tracking. Screen reader and Braille support enable non-visual learners to access content, while text customization options—such as adjustable size, color, and spacing—help accommodate visual preferences. Captions and transcripts make audio and video accessible to learners with hearing impairments, and responsive design ensures that content remains clear when magnified. These design choices create equitable access and allow educators to

adapt digital learning environments to each child's needs (Kolb). Finally, accessibility must extend beyond technical features to include multilingual and culturally responsive options that honor the diversity of learners' backgrounds. When children see themselves represented and can navigate tools comfortably, they are empowered to engage more deeply with content (Kolb).

Strategic Instruction

High-quality digital learning tools are not only engaging—they are strategically structured to guide learning toward clear, measurable outcomes (Kolb, 2025). Effective educational apps begin with well-defined objectives that align with early learning standards and developmental goals. Activities should follow a logical sequence, providing gradual scaffolding that helps children move from simple concepts to more complex skills (Kolb). The best tools present information in manageable chunks, include clear directions, and minimize unnecessary distractions that can derail focus or reduce cognitive engagement. Unfortunately, many so-called “educational” apps fall short in this area. Kolb notes that time-consuming tasks like avatar customization, excessive badges, or unrelated mini-games often dominate children's attention before any real learning occurs. These design choices may entertain but fail to reinforce meaningful learning or knowledge transfer. Instead, apps should maintain a consistent focus on purposeful engagement—encouraging exploration, reflection, and skill development rather than repetitive tapping or competition for points (Kolb).

Applications like ReadWriteThink: Student Interactives and DoodleLearning exemplify strong instructional design principles. Both provide structured activities, immediate feedback, and clear goals without unnecessary gamified elements (Kolb, 2025). This form of feedback is vital in early education, as it promotes persistence, independence, and a growth mindset—key elements of long-term academic success (Vaiopoulou et al., 2022). Learners spend their time reading,

writing, and problem-solving—activities directly tied to the learning objectives. This kind of strategic design helps educators maintain instructional focus and ensures that digital engagement supports, rather than distracts from, authentic learning outcomes.

Timely Feedback

Feedback is essential for learning, especially in early childhood, when children are developing reflection and self-regulation skills. High-quality digital tools provide immediate and specific feedback that helps children understand what they did well and what to try next (Kolb, 2025). Rather than vague praise like “Good job!”, effective apps give actionable prompts such as “Try matching the shapes another way” or “Count again and see what changes.” This kind of timely, constructive response reinforces understanding and keeps children engaged. Effective feedback is also continuous and adaptive, adjusting to each child’s progress rather than appearing only at the end of a task (Kolb). Apps like Khan Academy Kids and Teach Your Monster to Read offer real-time responses that guide learners step by step, while Endless Alphabet and Moose Math use visual and auditory cues to correct errors and reinforce success.

Free from Bias

Technology is never completely neutral—its design often reflects the assumptions, values, and biases of its creators. This means some digital tools may unintentionally reinforce stereotypes or exclude certain groups of learners.

Educators should carefully review apps and platforms to ensure that they promote inclusivity and reflect diverse cultures, languages, and abilities (Kolb, 2025). Kolb explains that bias can appear in several ways:

- Engineered inequity occurs when stereotypes are built into design—such as female avatars always wearing pink or male characters portrayed as leaders.

- Default discrimination happens when default settings, like language or voice options, ignore cultural or linguistic diversity.
- Coded exposure refers to technologies that work better for certain groups—for example, motion sensors tested mainly on lighter skin tones.
- Technology benevolence describes tools that claim to fix inequities but unintentionally reinforce them, such as AI algorithms that favor dominant groups based on historical data.

For early learners, exposure to biased technology can shape how they see themselves and others. Teachers should prioritize tools that offer customizable features, diverse representation, and equitable access for all students (Kolb).

Avoid Manipulative Design

High-quality educational apps should support healthy engagement, not addiction. Some digital tools use manipulative design tactics—like countdown clocks, reward loops, or pop-up ads—to keep children online longer. These features exploit young learners' natural curiosity and encourage the development of self-control, making it harder for them to disengage or focus on meaningful learning (Kolb, 2025).

Educators should watch for warning signs such as time pressure, where the app urges children to “hurry” or risk losing progress; lures, like tokens or flashy rewards that prioritize screen time over learning; and ads disguised as content, which blur the line between education and marketing (Kolb). Other concerning features include parasocial pressure, where animated characters guilt or shame children into continued play, and roadblock ads, which prevent exit until a timer runs out (Kolb). The best apps for young kids promote balance and well-being, encouraging short, focused use and incorporating natural breaks; tools that allow children to pause easily, reflect, or transition to hands-on play demonstrate respect for young users' developmental needs (Kolb). Ultimately, quality design

nurtures curiosity and focus—not dependency—helping children build healthy relationships with technology.

Safety and Security

According to Kolb (2025), all educational technologies designed for young children must comply with U.S. regulations such as the Children’s Online Privacy Protection Act (COPPA) and the Family Educational Rights and Privacy Act (FERPA). These laws require that apps safeguard student data, limit collection to what is educationally necessary, and store information securely. However, compliance alone is not enough. Educators should take an active role in evaluating whether apps are truly safe for classroom use. Tools like ISTE’s Edtech Index and Common Sense Media’s Application Privacy Evaluations allow teachers to review privacy ratings, data-sharing practices, and security policies before adoption (Kolb). Schools can also create internal vetting processes—checking app permissions, disabling unnecessary data tracking, and ensuring that login systems use secure authentication.

3.3 Evaluating and Selecting Digital Tools

Each year, educators are faced with a constant influx of new technologies, each claiming to enhance student learning. However, not all tools are created equal. To ensure that technology meaningfully supports learning goals, teachers need structured, evidence-based ways to evaluate quality, usability, and developmental appropriateness. Frameworks such as ISTE’s Teacher Ready Evaluation Tool, Kolak’s Tool for Evaluating the Educational Potential of Preschool Apps, and Kolb’s Triple E Framework provide practical guidance for selecting technology that is purposeful, inclusive, and instructionally sound. These frameworks help educators move beyond novelty and focus on how digital tools engage students, enhance learning experiences, and extend understanding into authentic, real-world contexts.

Frameworks for Evaluation

ISTE Teacher Ready Framework

The Teacher Ready Evaluation Tool, developed by the International Society for Technology in Education (ISTE, 2025), offers educators a structured, research-based framework for assessing the quality and classroom usability of digital learning products. Grounded in principles of learning science and user experience design, the tool helps educators make evidence-informed decisions about which apps, platforms, and programs best align with their instructional goals. It is especially useful for teachers, instructional coaches, and technology leaders seeking a consistent, objective process for selecting tools that promote both engagement and equity in early learning environments. The Teacher Ready Evaluation Tool evaluates products across five key dimensions (ISTE):

- **User Interface and Agency:** How intuitive and age-appropriate the interface is, and how much control learners have in navigating the tool.
- **Learning Design:** Whether the tool supports active, purposeful learning aligned with sound pedagogical principles.
- **Digital Pedagogy:** How effectively the tool integrates into classroom instruction and supports educator facilitation.
- **Inclusivity:** The degree to which the tool provides accessible, culturally responsive, and developmentally appropriate experiences for all learners.
- **Assessment and Data:** How well the product tracks learning progress, provides useful feedback, and protects student data privacy.

Each dimension includes specific indicators and “look-fors,” observable features educators can use to determine whether a product meets expectations (ISTE). Users assign a score of 1 (meets expectations), 0 (neutral), or -1 (does not meet

expectations) for each indicator. A positive overall score suggests that a product effectively supports learning goals and usability, while a negative score highlights potential concerns or design flaws (ISTE). Importantly, the tool goes beyond technical functionality by addressing pedagogical usability - how a product supports learning interactions, scaffolding, and engagement. Educators can apply the tool to a range of products, from curriculum platforms and assessment tools to interactive learning apps. The accompanying Teacher Ready Edtech Product Evaluation Guide provides deeper explanations, examples, and best practices for using the framework effectively (ISTE).

The Teacher Ready Evaluation Tool is an interactive resource available for free on ISTE's website, allowing educators to click through each evaluation category and score a digital tool or app directly within the platform. The tool automatically calculates an overall score based on the educator's responses, helping teachers quickly determine how well a product meets expectations for usability, learning design, inclusivity, and safety (ISTE, 2025). This hands-on, guided format makes it a practical and user-friendly option for educators and administrators evaluating new or existing edtech products. For teachers in early childhood and elementary settings, this tool offers a reliable way to ensure that technology adoption remains intentional, inclusive, and instructionally sound.

Tool for Evaluating the Educational Potential of Preschool Apps (Kolak, 2021)

Developed by Dr. Joanna Kolak (2021) with support from the IOE Early Career Impact Fellowship and the ESRC, this rubric provides an easy-to-use framework for early childhood educators to assess whether preschool apps offer genuine educational value. The rubric is free and in PDF format for teachers to print. The tool is designed for use after a short trial - educators spend about five minutes exploring the app and then rate it on 10 key criteria, each scored from 0–2 points

(0 = not at all, 2 = very much). Each tool is evaluated on the following criteria (Kolak):

1. **Learning Goal** – Does the app have a clear and focused learning objective targeting early developmental skills?
2. **Solving Problems** – Does it encourage children to think critically, reason, or solve problems creatively?
3. **Meaningful Learning** – Are skills taught in ways that connect to real-life contexts and experiences?
4. **Feedback** – Does the app provide clear, specific verbal feedback that helps children learn from mistakes and improve?
5. **Social Interaction** – Does it include interactive characters or prompts that engage children in guided learning?
6. **Opportunities for Exploration** – Does it let children explore, make choices, and experiment rather than simply follow a fixed sequence?
7. **Storyline** – Is there a coherent story that ties the activities together and sustains engagement?
8. **Quality of Language** – Does the app use clear, age-appropriate language that children can easily understand?
9. **Adjustable Content** – Can the difficulty be adapted or customized to match a child's skill level?
10. **App Design** – Is the layout simple, consistent, and free from ads or unnecessary distractions?

Educators or researchers explore the app for about five minutes, trying multiple activities, and then rate it using the ten criteria. The scores are totaled to produce an overall rating (Kolak, 2021):

- Scores above 7 indicate the app performs better than the average of popular apps reviewed.
- Higher scores suggest a stronger potential for learning and developmental benefit.

Kolak's rubric helps teachers quickly identify which apps are developmentally appropriate, purposeful, and educationally valuable. Unlike commercial app ratings focused on entertainment or usability, this tool emphasizes learning outcomes, interactivity, and cognitive engagement—key indicators of meaningful educational design for preschool learners. It also serves as a professional reflection tool, prompting educators to think critically about how and why technology is used with young children, ensuring that digital media supports—rather than replaces—hands-on exploration and social interaction.

Triple E Framework

The Triple E Framework, developed by Dr. Liz Kolb at the University of Michigan School of Education, is a practical tool that helps educators evaluate how effectively technology supports learning goals. Unlike many technology integration models that focus on the tools themselves, the Triple E framework emphasizes learning first—ensuring that digital tools serve to enhance, not replace, sound instructional practice (Kolb, 2020). At its core, the framework assesses three essential components (Kolb):

- **Engagement:** How technology actively involves students in the learning process, promoting focus, motivation, and social interaction.

- **Enhancement:** How technology deepens or supports understanding by providing scaffolds, differentiation, and opportunities for reflection and feedback.
- **Extension:** How technology connects classroom learning to students' real-world experiences, encouraging authentic application and lifelong learning skills.

Grounded in over two decades of educational research, the framework draws on theories of pragmatism, active engagement, social learning through technology, and meaningful integration of pedagogy and technology (Kolb, 2020). It reinforces that effective technology integration depends not on the newest or most advanced tools, but on intentional instructional strategies that foster creativity, collaboration, and authentic problem-solving (Kolb). The Triple E Measurement Tool, available as a free interactive digital tool on tripleeframework.com, allows teachers to answer guided questions and receive an automatic score indicating how well a lesson, app, or activity aligns with the three E's. This scoring system provides a benchmark to help teachers make informed, evidence-based decisions about whether a technology tool meaningfully supports their learning objectives.

Validated through independent research in 2019, the framework is both reliable and practical for real-world classroom use (Kolb, 2020). Teachers, instructional coaches, and administrators can use it to reflect on lesson design, strengthen professional practice, and promote thoughtful digital learning integration. The Triple E Framework empowers educators to become critical consumers of technology, using it not as a “magic bullet” but as a catalyst for active, social, and purposeful learning that keeps students meaningfully engaged in achieving academic and developmental goals (Kolb).

Section 3 Conclusion

Selecting the right digital tools is one of the most important steps in creating meaningful technology experiences for young learners. By using research-based frameworks and thoughtful evaluation practices, educators can ensure that digital media supports learning outcomes, promotes inclusivity, and enhances curiosity and creativity. Ultimately, the goal is not to find the flashiest app or newest device, but to identify tools that strengthen children’s engagement, deepen understanding, and extend learning beyond the screen. In the next section, we will explore how to integrate digital tools into early learning environments—translating these evaluation principles into effective classroom practice that blends technology with play, inquiry, and authentic exploration.

Section 3 Key Terms

Coded Exposure - A type of built-in bias where technologies work better for certain groups (for example, motion or facial-recognition tools tested mainly on lighter skin tones), leading to inequitable experiences.

Default Discrimination - Bias that appears when default settings—such as language, avatar options, or voices—center one dominant group and overlook cultural or linguistic diversity.

Engineered Inequity - Stereotypes and exclusions that are deliberately or unintentionally embedded into design choices (such as gendered colors or roles), shaping how children see themselves and others.

Evidence-Informed Decision-Making - The practice of using research, data, and structured evaluation tools to choose digital products that genuinely support learning goals rather than relying on marketing claims or novelty.

Inclusive Design - An approach to creating digital tools that intentionally supports diverse learners by incorporating features, representations, and options that reflect different abilities, cultures, and languages.

Learning Design - The way learning goals, content, activities, and scaffolds are structured within a digital tool to support purposeful, developmentally appropriate instruction.

Manipulative Design - Design tactics—such as reward loops, countdown timers, or guilt-inducing characters—used to keep children engaged for longer in ways that prioritize screen time over meaningful learning or well-being.

Parasocial Pressure - Emotional pressure created when on-screen characters urge, guilt, or flatter children into continuing to play, making it harder for them to stop or take breaks.

Safety and Security - Protections built into digital tools and school practices that safeguard children's data, limit unnecessary collection, and ensure compliance with privacy laws such as COPPA and FERPA.

Strategic Instruction - Intentional structuring of digital activities so they align with clear learning objectives, build skills progressively, and minimize distractions that do not support learning.

Teacher Ready Evaluation Tool - ISTE's research-based framework that helps educators rate digital products across dimensions such as usability, learning design, inclusivity, and data practices to judge classroom suitability.

Technology Benevolence - A form of bias in which technologies are marketed as solutions to inequity but unintentionally reinforce existing disparities—for example, algorithms trained on biased historical data.

Timely Feedback - Immediate, specific guidance provided by digital tools that helps children understand their errors, refine their thinking, and decide what to try next.

Triple E Framework - Dr. Liz Kolb's evaluation model that examines how technology tools Engage, Enhance, and Extend learning to determine whether they meaningfully support instructional goals.

User Agency - The degree of control and choice children have while using a digital tool—such as pacing, paths, and options—which supports autonomy, motivation, and deeper engagement.

Section 3 Reflection Questions

1. In what ways do you currently evaluate whether a tool is developmentally appropriate for your students? How might frameworks like Triple E, Teacher Ready Evaluation or Kolak's rubric make that process more systematic?
2. What criteria do you personally find most important when evaluating apps —active involvement, meaningful connections, accessibility, bias, or something else? Explain your reasoning.
3. Have you ever used a digital tool that appeared "high quality" but ultimately distracted students or undermined learning? What design features led to that outcome?
4. How do you ensure digital tools extend learning beyond the screen and into real-world contexts? Where do you see opportunities to strengthen that connection?

5. Do you feel your school or program has a consistent process for selecting digital tools? If not, what might a more intentional, research-based process look like?

Section 3 Activities

1. **Triple E Self-Assessment:** Select one digital tool and score it using the Triple E Framework. Reflect on whether the score matches your observations in practice.
2. **Kolak Rubric Trial:** Choose an app commonly used in your classroom, engage with it for at least five minutes, and rate it using Kolak's 10-item rubric.
3. **Bias Review:** Choose an app and analyze it for engineered inequity, default discrimination, or coded exposure. Document any representation gaps.
4. **Tool Comparison Chart:** Select two apps with similar purposes and compare them across five criteria: engagement, learning design, inclusivity, feedback quality, and bias
5. **Curated App List:** Develop a vetted list of recommended apps for fellow teachers, each with a brief justification grounded in Section 3's criteria.

Section 4: Effective Practices for Digital Tools in Early Learning

As digital tools become increasingly integrated into early learning environments, educators face the challenge of ensuring that technology enhances authentic learning experiences. Effective technology use in early education depends on intentionality, developmentally appropriate practice, and the preservation of play,

exploration, and social interaction as the foundations of learning. From infants exploring digital images alongside caregivers to school-age children conducting virtual investigations with global experts, technology can be used to enrich every stage of development when guided by thoughtful teaching and research-based practices. This section explores effective strategies for integrating digital tools across age groups, highlighting developmentally appropriate applications for infants and toddlers, preschoolers and kindergarteners, and school-age children. Drawing from current research and professional guidelines, it emphasizes how educators can use technology to inspire creativity, inquiry, inclusion, and family engagement—ensuring that digital learning supports whole-child development.

4.1 Reimagining Technology Use in Early Childhood Classrooms

Most early childhood educators are incorporating technology in ways that emphasize structure and control rather than exploration and collaboration (Lim and Wardrip, 2024). Although many teachers recognize the potential of digital tools to promote creativity and communication, classroom use often remains limited to direct instruction or academic reinforcement activities. Tablets and interactive whiteboards are frequently used for alphabet or math practice, rather than as tools for inquiry, storytelling, or peer collaboration (Lim and Wardrip). This pattern reflects broader research trends showing that technology in early childhood classrooms is often implemented in non-child-centered ways - through self-contained apps, adult-directed activities, or reward systems (Lim & Wardrip). Scholars argue that while digital tools can enhance learning, their value depends on whether they are aligned with developmentally appropriate practice (DAP). DAP emphasizes play, exploration, and social interaction as central to young children's learning, urging educators to adapt technology use to each child's developmental stage, cultural context, and individual strengths (Lim and Wardrip).

One major challenge identified by Lim and Wardrip (2024) is that many educators lack adequate training or confidence in designing technology-rich, child-centered lessons. As a result, devices are often used for drill-and-practice or classroom management rather than as catalysts for problem-solving and creative expression. The authors recommend that teachers embed digital tools into play-based contexts—using them to document learning, spark inquiry, or extend children’s ideas—rather than treating technology as a separate or reward-based activity. Ultimately, effective integration requires intentional planning, co-engagement, and flexibility. Technology should invite collaboration, communication, and curiosity, not simply repetition or passive screen time (Lim and Wardrip).

4.2 Effective Classroom Practice for Infants and Toddlers

According to the NAEYC (2025), technology use in infant and toddler settings should always be rooted in relationships and responsive interaction. During the earliest years, children’s learning depends primarily on their engagement with caregivers, peers, and the physical world. Any technology introduced at this stage should therefore serve as a bridge for communication and exploration, not as a replacement for human connection. For infants and toddlers, technology can be used to extend real-world experiences - such as showing digital photos of family members, animals, or familiar objects - and to expose children to diverse people and environments they might not otherwise encounter. These experiences, however, are most valuable when adults participate as co-viewers and conversational partners. Shared technology time provides opportunities to introduce new vocabulary, encourage pointing and naming, and model curiosity and respectful technology use (NAEYC).

It is essential to avoid passive or unsupervised screen time (NAEYC, 2025).

Research shows that young children under age two learn best through active

exploration, sensory engagement, and reciprocal interaction. Videos or electronic toys cannot substitute for the emotional regulation, comfort, and social learning that come from human relationships. Instead, technology should be incorporated as an active, social tool - for example, looking at digital photo albums together, playing simple touch-based cause-and-effect games, or using assistive technologies to support communication for children with special needs (NAEYC). Educators should ensure that any digital tools used are safe, sturdy, and developmentally appropriate for exploration. Devices should be designed to withstand handling by young children and free of hazards such as detachable parts. Most importantly, technology in infant and toddler classrooms should always occur within a context of conversation, guidance, and shared discovery, reinforcing that learning, even digital learning, is grounded in human connection (NAEYC).

4.3 Effective Classroom Practice for Preschoolers and Kindergarteners

During the preschool and kindergarten years, children are developing a strong sense of curiosity, creativity, and initiative. They are eager to explore how the world works and to express their ideas through multiple forms of media - from painting and dramatic play to building, singing, and storytelling. According to the NAEYC (2025), digital technology can serve as another creative medium that extends these explorations.

Using Technology as a Creative and Expressive Tool

High-quality digital tools can provide preschoolers with new ways to create, communicate, and collaborate. Interactive touchscreens with developmentally appropriate apps allow children to draw, design, and problem-solve while developing fine motor and early literacy skills. Similarly, child-friendly websites

and search tools introduce early research skills as children learn to ask questions and find information (NAEYC). For example, a class studying animals might use tablets to look up videos of animal habitats, then create their own illustrated digital books to document what they learned. Digital cameras and tablets can also support documentation and reflection. Teachers can photograph children’s block structures, art projects, or dramatic play scenes and use these images to spark reflection and discussion during group time (NAEYC). Children can narrate what they built or acted out, and teachers can record these audio explanations to create short digital portfolios that capture both the process and the product of learning. These portfolios can be shared with families online, helping parents stay connected to their child’s classroom experiences (NAEYC).

Expanding Learning Beyond the Classroom

Technology can expand children’s access to the world beyond their immediate environment. Virtual field trips—such as exploring a farm, aquarium, or museum through interactive video—allow children to experience places they may not be able to visit in person. Likewise, augmented reality (AR) tools can bring abstract concepts to life: for example, using an AR app to watch a butterfly “emerge” from its chrysalis on the screen after reading *The Very Hungry Caterpillar*. These immersive experiences blend imagination and reality, deepening understanding and engagement.

Sharing and Celebrating Learning

Digital tools also offer new opportunities for sharing and celebrating learning with a wider audience. Teachers might use classroom websites or digital projectors to showcase students’ artwork, performances, or collaborative projects (NAEYC, 2025). Co-created digital stories—where children narrate their own play, record songs, or design class books with their voices and photos—help build confidence,

pride, and communication skills (NAEYC, 202). These experiences also promote digital citizenship, as children begin to understand how their work can reach others in safe and respectful ways.

Supporting Inclusion and Differentiation

Finally, technology can be a powerful equalizer when used to support diverse learners and children with special needs. Assistive technologies, such as speech-to-text tools, adjustable audio levels, or adaptive input devices, allow all children to participate in classroom activities at their own pace and ability level (NAEYC, 2025).

Real Classroom Use

Konerman (2022) shares an example of a preschool classroom, where four-year-olds use the class tablet as part of a creative learning activity. They begin by taking photos of classroom objects - a block tower, a painting on the easel, and the dramatic play area. After exploring the gallery, students decide to personalize their photos by adding their own artistic touches. The teacher introduces the class to the markup tool built into the tablet's Photos app, demonstrating how to draw lines, change colors, and add details. The students quickly learn how to use the tool independently, experimenting with patterns, symbols, and shapes layered over the photographs. When they finish, the students send their completed images to the teacher's laptop for printing, learning how to share digital work across devices. Together, they print copies so students display one on the classroom art wall and take another home. The teacher also shares the photos with parents via SeeSaw. Over time, students become confident enough to teach other students how to use the markup feature, modeling both digital fluency and creative expression (Konerman).

This example illustrates how technology can serve as a tool for artistic exploration and documentation in early learning environments. When guided by educators, digital devices can extend children’s creativity—helping them capture, edit, and reflect on their work in meaningful ways. Teachers can support similar experiences by integrating the following creative and expressive apps into classroom activities (Jeulli, 2024):

- **Book Creator:** Allows children to compile photos, drawings, and voice recordings into digital storybooks.
- **Seesaw:** Enables students to upload and annotate their work, narrate their learning process, and share progress with families.
- **Draw and Tell HD:** Combines art and language by allowing children to draw pictures and record short narrations.
- **Tayasui Sketches School:** Offers an intuitive platform for digital drawing and painting with a variety of brush and color options.
- **FlipaClip:** Introduces early animation, allowing children to turn drawings into moving stories.
- **Apple Markup or Google Jamboard:** Built-in tools that encourage drawing, labeling, and collaborative creation.

By embedding these tools into centers or daily classroom activities, teachers help young learners use technology to express ideas, tell stories, and share learning in new ways. Rather than replacing traditional art materials, digital tools can enhance children’s creative confidence and communication skills, supporting both cognitive and expressive growth.

4.4 Effective Classroom Practice for School Age Children

As children enter the early school-age years, they start using the tools of their world—reading, writing, researching, and problem-solving—with increasing confidence and independence. Digital technology becomes one of these essential tools, shaping how children learn, communicate, and create. According to the NAEYC (2025), the goal during this stage is not only to help children consume technology responsibly but also to empower them to become producers and innovators—using digital tools for self-expression, collaboration, and discovery. In developmentally appropriate classrooms, technology is integrated as part of a broader ecosystem of learning experiences. Students engage with books, tablets, writing tools, and scientific instruments side by side, using each to explore ideas and demonstrate understanding in multiple ways (NAEYC). Teachers design learning opportunities that move beyond rote tasks to promote creativity, collaboration, and critical thinking—helping children understand that technology is not just something they use, but something they can shape and contribute to.

Using Technology for Inquiry

Technology can be a powerful tool for supporting inquiry-based learning in school-age classrooms. As children grow more independent and curious, they begin asking complex questions about the world around them, questions that invite exploration, investigation, and discovery. Digital tools such as search engines, interactive media, and video conferencing expand the ways children can pursue knowledge for themselves (Konerman, 2022). Inquiry in the digital age is about process as much as product. While typing a question into Google or asking Siri can yield quick answers, these methods only scratch the surface. A more meaningful approach encourages students to explore information through multiple sources—testing ideas, comparing evidence, and engaging directly with experts or digital simulations (Konerman). Today's classrooms can integrate child-friendly

microscopes, interactive videos, and virtual tours to help children deepen their understanding of scientific and social concepts.

Real Classroom Use

Konerman (2022) describes how one teacher guided her students through a yearlong inquiry on animal life cycles. When a child asked, “Do crabs lay eggs?”, the question sparked a collaborative investigation. The class read nonfiction picture books about animal reproduction, observed tadpoles and chicks firsthand, and documented their findings. When questions remained, the teacher extended the inquiry by arranging a virtual meeting with biologists at the University of Cincinnati. The children prepared their own list of questions and spoke directly with scientists through video conferencing, turning curiosity into dialogue. They even shared one of their classroom chicks with the researchers during the call, creating a real-time exchange of learning (Konerman).

This experience illustrates how digital tools can transform traditional inquiry projects into dynamic, interactive learning opportunities. Teachers can use video conferencing platforms like Zoom or Google Meet to connect students with field experts; virtual field trip tools such as Google Earth, National Geographic Kids, or Discovery Education Experience to explore hard-to-reach environments; and digital microscopes or augmented reality (AR) apps like Merge Explorer or Seek by iNaturalist to examine specimens up close (Konerman, 2022). These tools extend inquiry beyond the classroom walls, helping students see themselves as researchers and knowledge creators.

Technology Tools and Interactive Media for School-Age Children

At this stage, digital tools should support exploration, creativity, collaboration, and problem-solving across all subject areas. Effective classroom integration means moving beyond rote or drill-based apps and instead selecting interactive, open-

ended technologies that help children investigate ideas, express themselves, and connect their learning to real-world contexts (NAEYC, 2025). Educators can incorporate a variety of tools—ranging from coding platforms and collaborative apps to digital storytelling programs and assistive technologies—to enrich learning experiences and promote digital literacy. The examples below highlight how teachers can intentionally use technology to enhance engagement, accessibility, and inquiry in school-age classrooms (Jeulli):

- **Interactive and creative media:** Encourage children to explore well-designed educational apps, games, and software that go beyond drill-and-practice. Tools like Scratch and Tynker allow students to code interactive stories or animations, promoting logical reasoning and creativity.
- **Animation and storytelling:** Stop Motion Studio empowers children to become storytellers and filmmakers by creating their own animated movies using everyday materials like toys, clay, or household items. The app's intuitive, frame-by-frame interface allows students to capture still images, adjust frame rates, and add music, sound effects, or voiceovers to bring their stories to life.
- **Tools for collaboration:** Introduce platforms such as Google Workspace for Education or Padlet to support writing, brainstorming, and group projects. These tools encourage playful experimentation with text, images, and ideas while fostering communication skills.
- **Exploratory STEM tools:** Use geometry and science apps like GeoGebra, PhET Interactive Simulations, and Merge Cube AR to let students manipulate shapes, visualize concepts, or conduct virtual experiments. Digital microscopes and data collection sensors can enhance science investigations by allowing hands-on exploration of natural phenomena.

- **Digital storytelling:** Provide opportunities for students to record and edit videos, narrate digital books, or create podcasts using tools such as Book Creator, WeVideo, or Canva for Education. These activities strengthen literacy, communication, and digital citizenship skills.
- **Global collaboration and communication:** Use safe, child-appropriate platforms for connecting with classrooms around the world through video conferencing, shared blogs, or collaborative projects, building cultural awareness and empathy.
- **Documentation and reflection:** Teachers can record students' reflections, stories, or project explanations as audio or video files. These can be compiled into digital portfolios using tools like Seesaw or Bulb, giving children ownership over their learning progress.

By embedding these practices into daily instruction, educators foster digital fluency while maintaining a balance between technology and traditional hands-on learning. Technology becomes a bridge between inquiry and expression, allowing children to explore, question, and create in ways that mirror how adults use digital tools in the real world. Ultimately, as NAEYC (2025) emphasizes, effective technology integration for school-age learners is guided by intentionality. When teachers select tools that are safe, interactive, and inclusive, technology enhances the foundational skills of literacy, problem-solving, and social connection that define early academic success.

4.5 Technology and Media to Enhance Curriculum for All Ages

Digital tools allow teachers to adapt classroom materials for a variety of learning contexts, making curriculum resources more accessible to children and families—both in and beyond the classroom (Konerman, 2022). One effective approach is developing digital libraries that include familiar and beloved children's books, such

as *Brown Bear, Brown Bear, What Do You See?* and *The Very Hungry Caterpillar*. These collections, often available through classroom devices or reading platforms, feature read-aloud options in multiple languages, helping to support both multilingual and monolingual learners (Konerman). By hearing stories in their home language and in English, children build vocabulary, deepen comprehension, and strengthen cultural identity. Shared digital reading experiences can also foster community within diverse classrooms, allowing all children to participate in storytelling and discussion, regardless of language background (Konerman).

Teachers can also enhance curriculum delivery by creating virtual classroom hubs or websites that serve as bridges between home and school. These platforms centralize learning materials, classroom updates, and family resources, ensuring consistent communication and accessibility (Konerman). While many schools have learning management systems (LMS) that can be used for this purpose, an option like Google Classroom is free and can offer the same experience.

Real Classroom Use

Konerman (2022) describes a teacher who designed such a hub for her hybrid classroom during the COVID-19 pandemic. Her website allowed families to access lesson materials, view class projects, and participate in virtual learning experiences tailored to their needs. This teacher also used interactive tools like Google Slides to design shared activities that engaged students across physical and virtual spaces. For example, her class conducted a real-time voting activity about their favorite Eric Carle books using a digital graph. Both in-person and remote learners could cast votes—either online or on a paper version displayed in the classroom. During group time, children discussed the results together via video conferencing, allowing everyone to engage in the same learning experience (Konerman).

This model demonstrates how technology can be used to integrate learning, collaboration, and community building. Whether through digital read-alouds, class websites, or shared interactive presentations, technology makes curriculum more adaptable and inclusive. It allows educators to design experiences that connect children's learning across environments, engage families in authentic ways, and ensure that every student—regardless of location or language—feels part of the classroom community (Konerman, 2022).

Section 4 Conclusion

When used intentionally and developmentally appropriately, technology can strengthen the learning environment at every stage of early education. Whether documenting a toddler's exploration, supporting a preschooler's storytelling, or guiding a school-age child's inquiry project, digital tools extend children's capacity to communicate, create, and connect. The key lies in educator facilitation—using technology to enhance relationships, encourage discovery, and foster digital fluency within meaningful, play-based learning.

Section 4 Key Terms

Assistive Technology - Digital or electronic tools that support communication, access, or participation for children with disabilities, allowing them to engage fully in classroom activities.

Child-Centered Technology Use - An approach to technology integration that prioritizes children's interests, developmental needs, autonomy, and play—rather than adult-directed or drill-based digital activities.

Co-Viewing - A practice where adults and children use digital media together, engaging in shared conversation and interaction to promote learning, vocabulary development, and social connection.

Creative Media - Digital tools that allow children to express ideas through multimodal creation—such as drawing, photography, animation, or narration.

Developmentally Appropriate Integration - The intentional use of digital tools in ways that align with children’s age, abilities, cultural context, and learning needs, preserving play and exploration as central to early learning.

Digital Documentation - The use of devices such as tablets or digital cameras to capture children’s work, play, and learning processes for reflection, assessment, or communication with families.

Digital Inquiry - A process in which children use technology—such as search tools, virtual field trips, or video conferencing—to explore questions, investigate topics, and engage in collaborative research.

Digital Learning Artifacts - Digital products created by children—such as recordings, annotated photos, or multimedia stories—that demonstrate learning, creativity, and reflection.

Family Engagement Technology - Digital platforms or tools that strengthen communication and collaboration between educators and families, such as classroom hubs, learning platforms, or shared media.

Interactive Storytelling - The use of digital tools that allow children to co-create or participate actively in stories through narration, images, animations, or multimodal features.

Inquiry-Based Technology Use - A method of integrating digital tools to support questioning, investigation, evidence gathering, and problem-solving during authentic learning experiences.

Markup Tools - Digital annotation features (e.g., drawing, labeling, highlighting) that allow children to personalize photos, document thinking, and engage creatively with digital media.

Multimodal Expression - The use of multiple modes—visual, verbal, auditory, and digital—to help children communicate their ideas, often supported by creative digital tools.

Play-Based Technology Integration - The incorporation of digital tools into playful, exploratory, hands-on learning environments rather than replacing traditional play experiences.

Shared Digital Experiences - Technology-based activities that children and adults participate in together—such as virtual field trips, collaborative projects, or interactive read-alouds—that promote social learning.

Socially Mediated Technology Use - Digital experiences that emphasize interaction, collaboration, and conversation among peers and adults, supporting social-emotional and cognitive development.

Technology-Rich Inquiry - A learning approach where digital tools deepen exploration, support scientific thinking, and connect children with experts, simulations, or real-world environments.

Virtual Classroom Hub - A centralized digital space (e.g., website, classroom portal, shared platform) where educators organize learning materials, announcements, assignments, and family communication.

Virtual Field Trip - A digital experience that allows children to explore locations, environments, or phenomena they cannot easily access in person, using videos, live feeds, or interactive simulations.

Section 4 Reflection Questions

1. Which age group (infants/toddlers, preschoolers/kindergarteners, school-age children) do you feel most confident integrating technology with? Which age group feels most challenging, and why?
2. Think about an app or digital tool your students love. What learning opportunities does it open—and what limitations might it also introduce?
3. Virtual field trips can connect children to places they may never visit in person. What role could virtual experiences play in your curriculum, and what boundaries would you need to consider?
4. How effectively do you involve families in your technology practices? Would a virtual classroom hub or digital portfolio strengthen family engagement in your setting?
5. Reflect on your own training or professional learning. Have you received enough guidance to design technology-rich, child-centered lessons? What gaps do you still feel?
6. What opportunities do you see to integrate technology into dramatic play, block play, science exploration, or outdoor learning?
7. If you could redesign one learning center or routine to integrate technology more intentionally, what would you choose and why?

Section 4 Activities

1. **Creative Tool Trial:** Try a new creative app and design a short activity inviting children to express ideas through multimodal creation.
2. **Documentation Practice Session:** Use a tablet or camera to document children's play, then reflect on how digital documentation supported assessment or reflection.
3. **Preschool Storytelling Project:** Have children produce a short digital story using photos, drawings, or audio recordings. Analyze how the process supported language or creativity.
4. **Virtual Field Trip Exploration:** Select a virtual field trip tool (e.g., Google Earth or National Geographic Kids) and plan one exploratory experience connected to your curriculum.
5. **Virtual Classroom Hub Draft:** Begin designing a digital classroom hub or family communication page using a simple platform (Google Classroom, Padlet, or a website builder).
6. **Inquiry Project Enhancement:** Take an existing inquiry activity and add one meaningful digital extension—such as interviewing an expert or exploring a digital simulation.
7. **Family Engagement Audit:** Review how families currently engage with digital communication tools and identify opportunities to improve accessibility or collaboration.

Course Conclusion

Technology in early childhood education holds tremendous potential - but its effectiveness depends on the educator's purpose and practice. When used

intentionally, digital tools can foster creativity, connection, and curiosity across all developmental stages. When used passively or without reflection, they risk overshadowing the very elements that make early learning so powerful: play, interaction, and discovery. This course has guided educators through the process of understanding, evaluating, and implementing technology in ways that uphold the principles of developmentally appropriate practice. Participants have explored how to balance innovation with child-centered pedagogy, assess digital tools for quality and safety, and design experiences that engage children as active creators—not just consumers—of technology. Ultimately, the thoughtful integration of technology can expand learning possibilities while preserving what matters most in early childhood: joyful exploration, hands-on engagement, and authentic relationships. As educators continue to adapt to a changing digital landscape, the guiding question remains the same: **how can technology serve the child, the classroom, and the community in ways that deepen learning and connection?** Through intentional use, collaboration, and reflection, early childhood educators can harness the power of technology to create learning environments that are innovative, inclusive, and developmentally rich—preparing every child to thrive in a connected, creative, and ever-evolving world.

Classroom Example

Mr. Lions teaches a kindergarten class in a public school located in an urban neighborhood. His students come from diverse linguistic, cultural, and socioeconomic backgrounds, and many are dual language learners or children with varying developmental needs. A passionate advocate for play-based learning, Mr. Lions believes that children learn best through exploration, collaboration, and creativity.

Recently, his school adopted a new initiative to integrate digital tools into early learning environments, encouraging teachers to use technology to enhance play, storytelling, and inquiry. While Mr. Lions is enthusiastic about this initiative, he wants to ensure that technology supports - not replaces - the hands-on, relational, and imaginative experiences that define early childhood education. He strives to find a balance between digital innovation and traditional play, fostering digital literacy while maintaining a warm, child-centered environment.

Challenges

- **Balancing Play-Based Learning with Digital Innovation:** Mr. Lions believes deeply in the power of tactile, imaginative play for young children's development. However, he is uncertain how to meaningfully integrate tablets, touchscreens, and interactive media into daily routines without overshadowing sensory experiences like block play, art, or dramatic storytelling. He wants to ensure that technology enriches play rather than directing it.
- **Ensuring Developmentally Appropriate Use:** With so many apps marketed as "educational," Mr. Lions struggles to identify which digital tools genuinely support children's learning. Some apps seem overstimulating or overly structured, while others offer open-ended exploration that aligns with his philosophy. He seeks guidance on how to evaluate and select high-quality, research-backed tools that promote creativity, curiosity, and critical thinking.
- **Supporting Equity and Access:** Not all families in Mr. Lions' class have access to technology at home. Some children are comfortable using tablets, while others have limited experience with digital tools. Mr. Lions wants to create equitable opportunities for every child to develop digital literacy,

while also helping families feel confident about safe and balanced technology use at home.

- **Integrating Digital Documentation and Family Engagement:** Mr. Lions wants to use technology to strengthen communication between school and home. He is interested in tools like Seesaw or Book Creator to document learning, record children’s stories, and share progress with families. However, he worries about privacy, consent, and ensuring that families of all backgrounds can access and engage with these platforms.
- **Using Technology for Creativity, Not Compliance:** Mr. Lions has noticed that many early learning apps focus on repetitive drills or reward systems rather than creative expression. He wants children to use digital tools for storytelling, music-making, and design—activities that nurture imagination, problem-solving, and collaboration.

Considerations for Support and Improvement

- How can Mr. Lions design a balanced classroom environment where technology supports hands-on exploration and imaginative play?
- What criteria or frameworks could help him select high-quality, developmentally appropriate digital tools?
- In what ways might Mr. Lions engage families in conversations about healthy screen habits, digital citizenship, and using technology for learning at home?
- How can assistive technologies and inclusive digital tools ensure that every child, including those with developmental delays or language differences, can participate meaningfully?

- What strategies could help Mr. Lions use digital tools for authentic documentation and communication while maintaining child privacy and family accessibility?
- How might partnerships with local libraries, museums, or early learning technology labs expand children’s digital exploration and connect classroom learning to the broader community?



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